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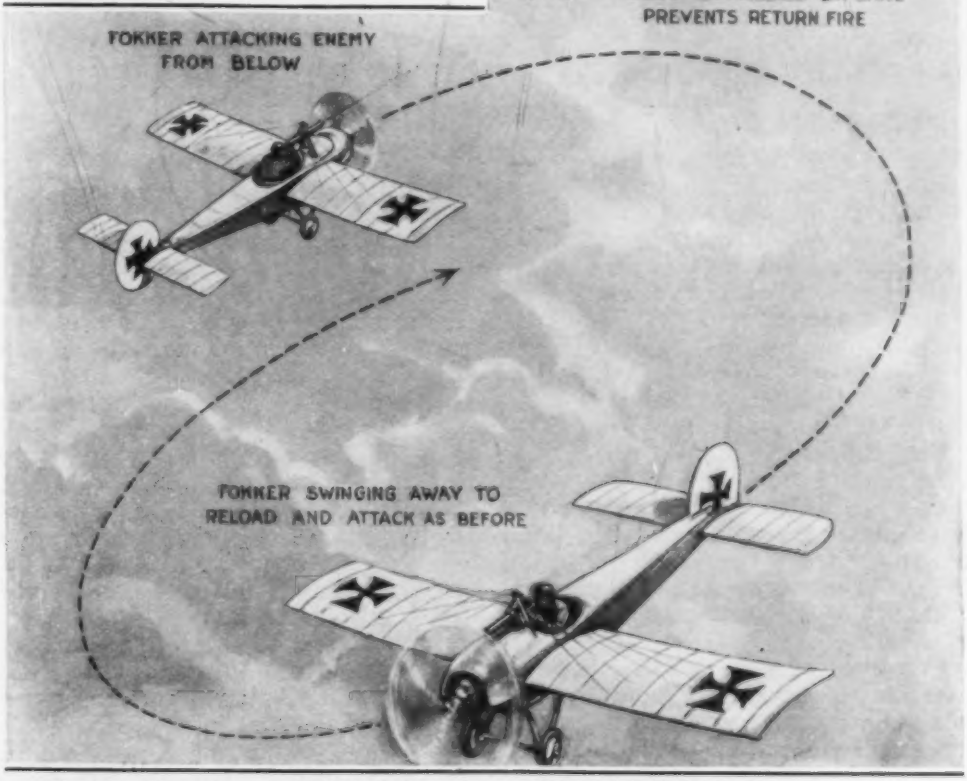
Monoplane Gives Germans Prestige in Air

BRITISH airmen operating along the western front were severely harassed by German aerial fighters during the first part of this year. The Royal Flying Corps sustained heavy losses and was out-maneuvered time and again by the enemy, although previously it had held supremacy in the air with remarkable consistency. The credit for this spectacular spurt of success by the Germans is given the small high-powered Fokker monoplane. A considerable number of these craft are understood to have been used in Germany's aggressive campaign. The machine is not of a new type, although it was recently redesigned in some particulars and developed into a

BODY OF ALLIED BIPLANE PREVENTS RETURN FIRE



The Artist Shows Here the Method of Attack Used by Pilots of Swift Fokker Monoplanes against the Slower Craft of the Allies on the Western Front

formidable, but unstable, craft, the details of which are only partly known. The wing span is small, amounting to about 39 feet. The engine, which is of the rotary type, develops either 150 or 200 hp., the correct figure being a matter of some debate. A speed of over 100 miles an hour and a high degree of climbing ability are given by it. This swiftness of flight, and ability of rapid ascent, for several weeks made it a decidedly serious menace to the slower but sturdier machines operated by the allies.

In appearance the machine is not greatly unlike the latest type of Morane such as was used by Garros. It is armed with a machine gun fixed before the pilot and fired "through" the propeller. Its agility enables its pilots to employ a method of attack which, for a while at least, placed the British at an extreme disadvantage. When an enemy was sighted, a driver of a Fokker climbed to a point a few hundred feet beneath the former. With its machine gun spitting a stream of bullets against the bottom of the fuselage of the slower craft, it usually made a quick, straight dash from behind. In this position the offensive craft was in no danger of being a target for its opponent. By firing at the enemy from below, a German pilot was frequently able to wound or kill his adversary or disable the latter's craft. If unsuccessful in accomplishing this in the first attack, he steered his machine so as to bring it down and around to a similar position again, at the same time reloading the machine gun.

It is understood that the British now have at the front machines, some of American manufacture, which are fully as formidable and swift as the Fokker and more stable by virtue of being greater in wing spread. With these they have apparently overcome the embarrassment, which for a period was serious.

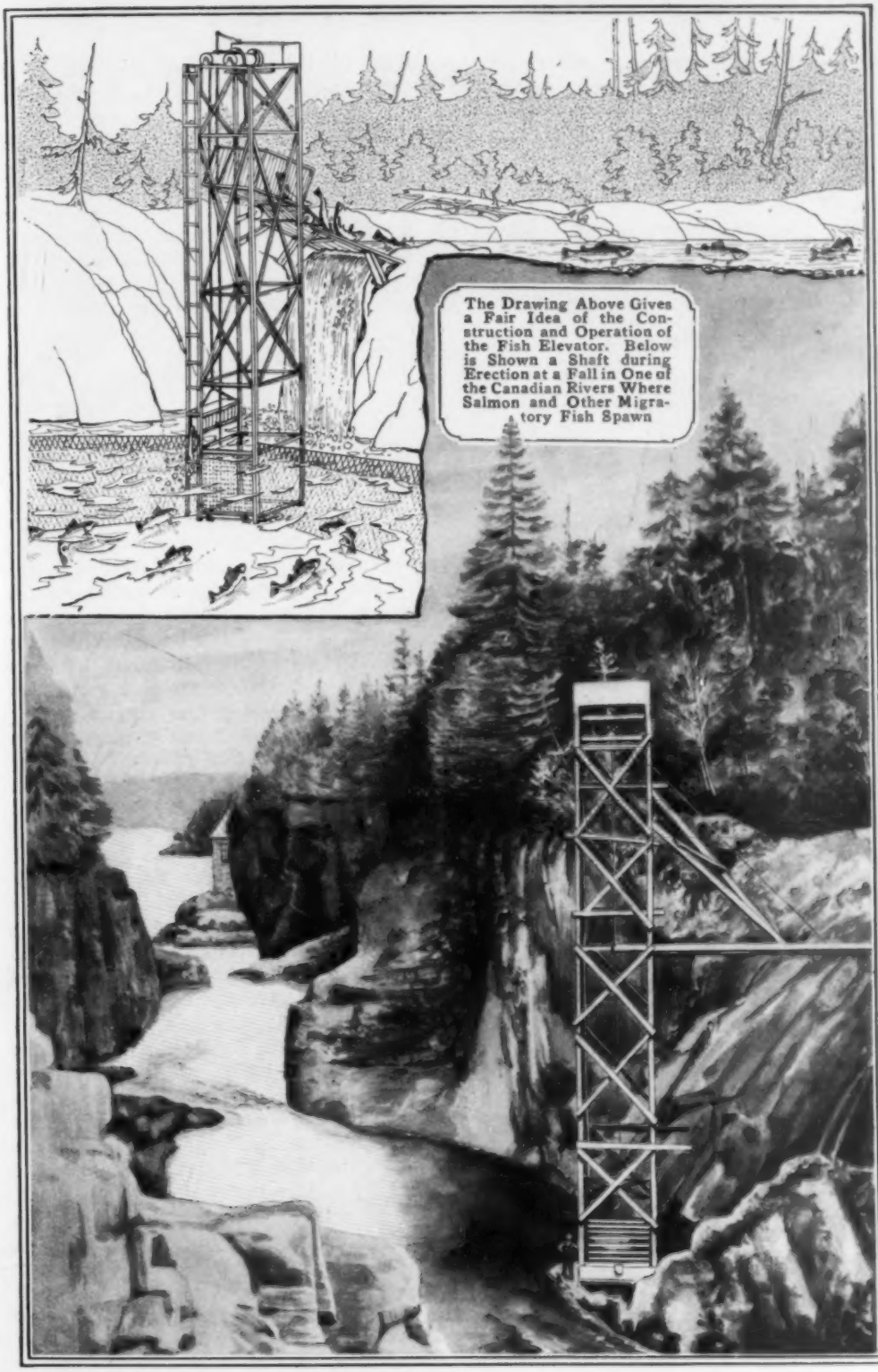
FISH LIFTED OVER FALLS BY INGENIOUS ELEVATOR

TO enable migratory fish to pass such barriers as waterfalls and dams when ascending a river to spawn, the Canadian commissioner of fisheries has developed an elevator which is apparently practicable. It has been placed in service at a 24-ft. fall in the St. Croix River, N. B., and is operating successfully, according to advices.

In part, the device consists of a vertical shaft erected several feet from the falls. Guides, or walls, radiate from both sides of the structure to the opposite banks of the stream so that fish are led to it. A cage in which the latter are trapped and carried to the top of the shaft, where they are automatically dumped into a sluiceway and discharged into the water on the upstream side of the barrier, is hoisted by means of a counterpoise tank which is periodically filled with water from a supply reservoir surmounting the tower. The cage and tank are secured to the opposite ends of a cable that passes over pulleys at the top of the shaft.

The fish compartment is provided with two doors, one at each end. When it is at the bottom of the shaft beneath the water one of these gates is raised to permit fish to enter. On the other hand, an auxiliary door on the shaft lets down and prevents fish from swimming around to the back side of the guides or into the space normally occupied by the carrier, when the latter ascends.

The operation of the device is controlled from the supply reservoir rather than by the counterpoise. When the former becomes full of water a rope leading from the lever of a ball valve releases a catch holding the auxiliary gate open at the bottom of the tower. Likewise, the ball valve having been raised by the water in the reservoir causes the counterpoise tank to fill rapidly. As the latter commences to descend and raise the fish compart-



The Drawing Above Gives a Fair Idea of the Construction and Operation of the Fish Elevator. Below is Shown a Shaft during Erection at a Fall in One of the Canadian Rivers Where Salmon and Other Migratory Fish Spawn

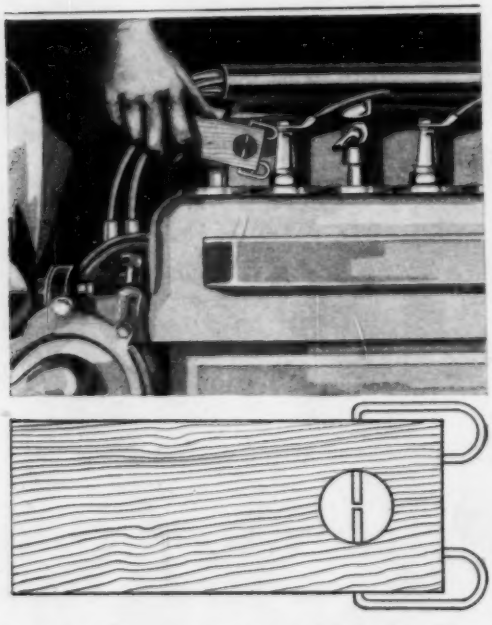
ment, the auxiliary gate, which has already been unlocked, drops into place. The door of the cage next closes, and the fish are carried to the sluiceway at the upper part of the shaft, where they are discharged. This is done when the cage is tilted by means of two rollers and a pair of curved guides which it strikes. The front gate is released at the same time and drops open.

As the propelling tank reaches a point near the bottom of the shaft it comes in contact with an arm that actuates a valve and releases the water from it gradually. When the tank is empty, the fish cage, which is heavier than it, drops back to the river, readjusting the gates and elevating the counterpoise.

The supply tank from which water flows to the counterpoise is filled by means of a hydraulic ram. The elevator can be built to almost any required height and may be placed, if necessary, a considerable distance from a fall. In the latter instance a longer sluiceway would be needed than otherwise, but this would be about the only necessary modification. By regulating the valves the fish cage can be lifted at intervals of from a few minutes to several hours, as desired.

HANDY SPARK-PLUG TESTER FOR MOTOR-CAR OWNER

For the motorist a convenient and exceedingly simple spark-plug tester has been introduced which is so inexpensive that it is being distributed by different concerns for advertising purposes. It consists of two copper wires and a small piece of wood with a circular hole at one end. The wires are bent around two corners of the stick and passed through opposite edges into the small aperture, where their ends are separated by only a hair's breadth. Obviously by touching the exposed parts of the wires against the terminal cap and the base of the plug, sparks will jump across the gap between the two wires, providing, of course, that the plug is working. When a cylinder is not working properly the trouble can be located quickly in this manner.

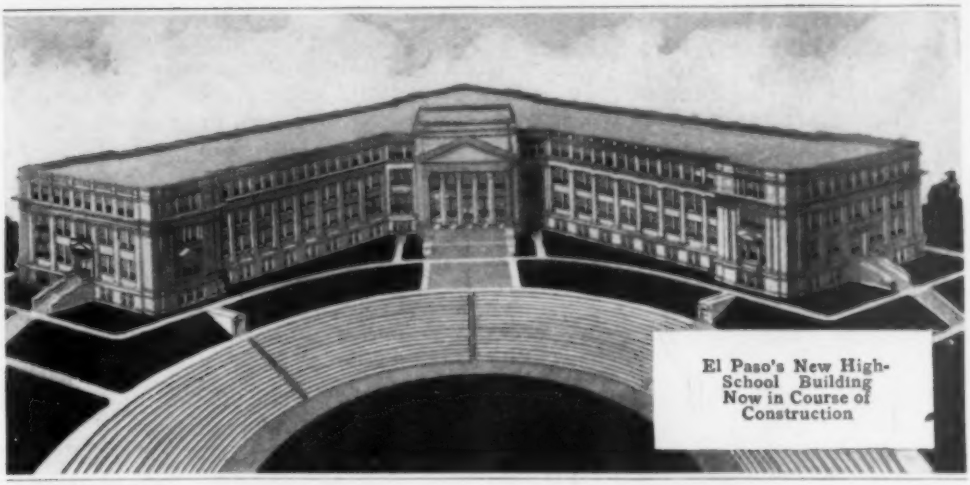


Contact is Made with the Terminal Cap and the Base of a Plug, a Spark Showing in the Gap Providing There Is No Trouble

EL PASO BUILDING SCHOOL OF UNUSUAL DESIGN

What will be one of the most attractive high-school buildings in the Southwest when completed is now in the course of erection at El Paso, Texas. The structure is being built in the form of a right angle on a mesa situated in the foreground of Mount Franklin, where it can be seen from nearly all parts of the city. It is to be of reinforced concrete faced with pressed brick and terra cotta of a color harmonizing with the gray background formed by the mountain.

The central entrance will be on the inner side of the building at the point from which the two wings project. Broad steps will lead from it down a short terrace to the top of an imposing reinforced-concrete stadium capable of seating 10,000 persons. This will be



El Paso's New High-School Building Now in Course of Construction

arranged with 17 tiers and be 300 by 390 ft. in size. It will provide space for a baseball diamond, football grid-iron, and a quarter-mile oval. It will be understood that the stadium is to be immediately in front of the building and bordered at one end by the two long wings of the latter. Tunnels will lead to the structure from both the young women's and men's gymnasiums located in the sub-basement.

An auditorium, which with a balcony will be capable of accommodating 1,500 persons, will be provided on the main floor of the school. On this same level there also will be a library and reading room, retiring rooms, and 16 class-rooms. The physical, biological, and chemical laboratories are to be on the floor above. The domestic and manual-arts departments with shops, kitchens, and a model bungalow are to be in the sub-basement, where there also will be a swimming pool. The building will be 800 ft. in length, 83 ft. in width at the ends, and will cost $500,000.

CHIFFONIER AND CEDAR CHEST COMBINED

A chiffonier so constructed that what appears to be the two lower drawers is in reality a cedar chest, is now being manufactured. This convenient article of furniture is made in various woods, the double drawer, or chest, being lined with cedar and faced with the wood of which the rest of the chiffonier is made. The large drawer is made like a cedar chest with lock corners and flush back. The space into which it fits has a dust-proof top and bottom. This chiffonier affords the protection against moths that makes a cedar chest so desirable, and so obviates the necessity of buying a separate piece of furniture which will keep out moths.

The Space for the Two Lower Drawers in This Chiffonier is Occupied by a Cedar-Lined Double Drawer Which Answers the Purpose of a Cedar Chest

SMALL MULTIPLYING DEVICE CLAMPS TO PENCIL

Designed in the form of a cylinder which may be attached to the blunt end of a pencil, a novel little multiplying device which by a simple adjustment

By Turning the Shell so That a Desired Multiplicand and Multiplier Are beneath Each Other, the Product of the Two is Given

will show the product of any two numbers up to 12 times 12, has been invented. Obviously it is intended for those individuals who have not mastered the multiplication table, but who are frequently required to make elementary calculations. The contrivance assists such persons, although it does not necessarily tend to teach them anything. The outer shell, which may be rotated, is provided with 12 numbered holes that extend in a ring about its circumference at the top. In a spiral which reaches once around the cylinder, starting at the top beneath the second hole and extending to the bottom immediately under the twelfth opening, is another series of apertures. Wound about a drum inside of the device is a table. The figures in the top row run consecutively from 1 to 12. The second line multiplies the first by two and reads from 2 to 24. The others are arranged similarly so that they read from 3 to 36, 4 to 48, 5 to 60, and so on. The numbers stamped in the cylinder above the top ring of holes serve as the possible multiplicands. Correspondingly the figures in the first row on the table, which are those visible through the aforementioned holes, act as the multipliers. The product of any two numbers is found in the hole immediately below the one through which the multiplier is seen, when the cylinder has been turned so that the latter figure appears under the desired multiplicand.

APPARATUS FOR COMBATING ENEMY AIR CRAFT

Patent rights have recently been granted to a Peruvian inventor who has developed an aeroplane destroyer so designed as to enable a gunner to determine quickly the elevation and velocity of an enemy craft and fire upon it with accuracy. Briefly it consists of a machine gun combined with a range-finding and sighting mechanism. A large camera obscura constructed of armor plate in the form of a dome, fitted with a ground-glass flooring and provided at the top with a large lens, represents an important part of the device. A pivoted arm, which extends through an opening in the steel housing, holds a machine gun at its upper end and an adjustable pointer at its lower extremity. Delineated on the camera, or image-receiving, surface is a diagram arranged with direct reference to the focal length of the lens. This consists of rectangular coördinates and concentric circles having a point in line with the axis of the lens as a common center. The graduations are made in reference to the lens' focal length so that the coördinates enable an operator to determine instantly the distance of an air craft, the image of which is projected upon the glass. The velocity of a machine is measured by timing the passage of its image across a specific space on the coördinate system. The circular system is graduated so that each division

represents a definite elevation. A gunner knows the trajectory of his rifle for various elevations, and thus may compute mentally what allowance must be made in aiming to hit the flying machine. The gun sights are always in accurate alinement with the pointer. Thus an adjustment of the latter affects the former. In making adjustments, the pointer is placed on the ground glass in the path of the moving image and sufficiently far ahead of it to make the proper allowance for the rifle's trajectory. It is then moved at the same rate as the image of the target which it precedes. This simple operation keeps the gun in proper alinement with the air craft and makes further calculations unnecessary. The housing being constructed of armor plate, the gunner, who works from the interior of it and fires the rifle with an auxiliary trigger which is extended inside of the camera obscura, is afforded effective protection. A modified type of the apparatus is so constructed that it can be mounted aboard a ship without its efficiency being impaired by the rolling motion of the latter, it is claimed.

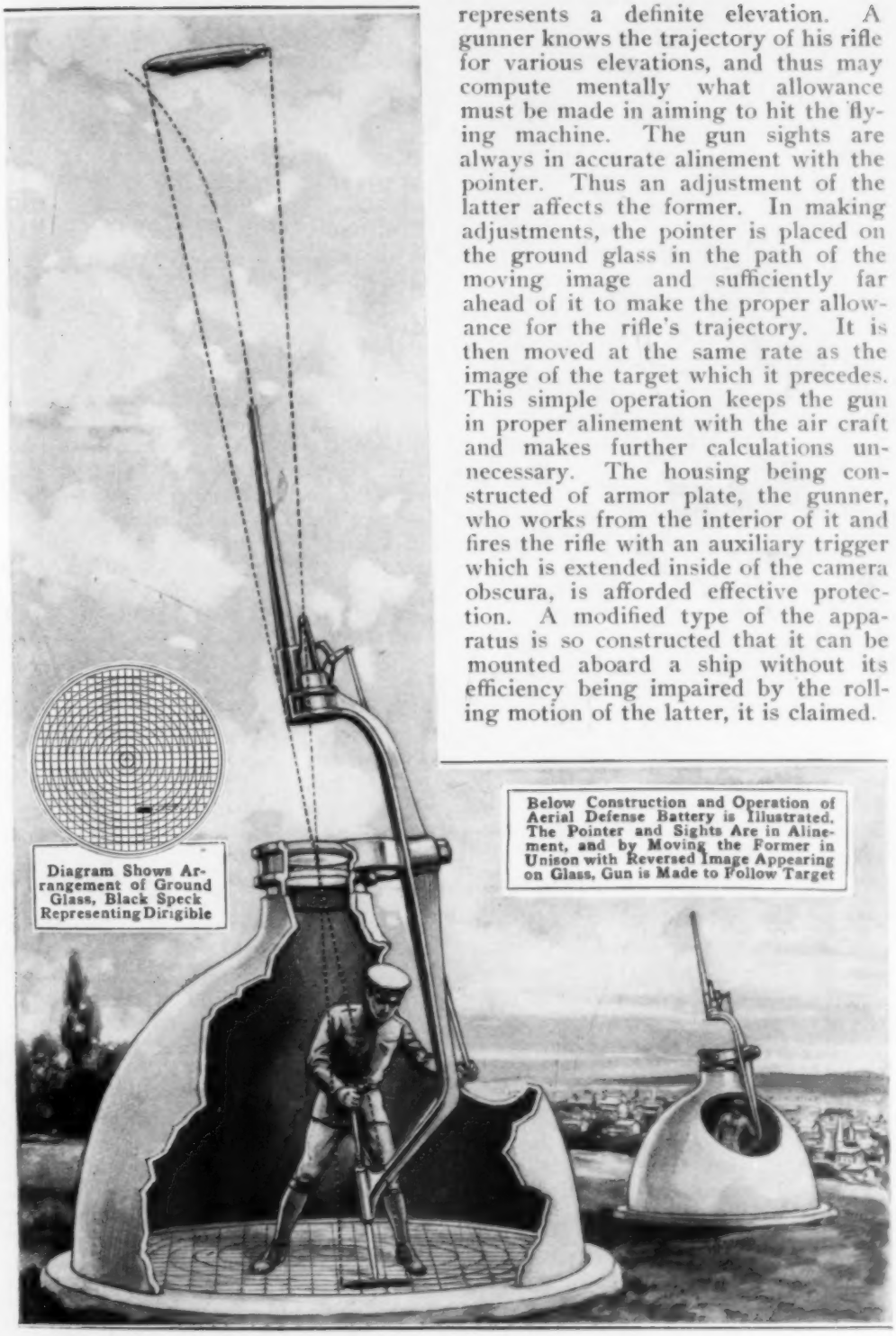


Diagram Shows Arrangement of Ground Glass, Black Speck Representing Dirigible

Below Construction and Operation of Aerial Defense Battery is Illustrated. The Pointer and Sights Are in Alinement, and by Moving the Former in Unison with Reversed Image Appearing on Glass, Gun is Made to Follow Target

CHISELED GRANITE MOUNTAIN WILL COMMEMORATE CONFEDERACY

STONE MOUNTAIN, a great naked dome of light-gray granite, an hour by motor from Atlanta, will possibly be transformed into a colossal monument commemorative of the sacrifice and military endeavors made by the South during the Civil War. In the upper portion of the mountain's precipitous face it is expected to chisel a frieze representative of the once formidable army of the Confederacy. When it is completed the project will represent the most stupendous piece of sculpturing ever executed.

The financing of this enterprise is in the hands of the Stone Mountain Confederate Memorial Association, which is headed by the honorary president of the United Daughters of the Confederacy. It is estimated that $2,000,000 will be sufficient to carry out the undertaking, and this sum is to be raised by subscription in the South. The entire façade of the mountain, enough of its crest to preserve its skyline, and an 80-acre tract at the base which will be developed into a park, have been donated for the memorial. This property will remain under the custodianship of the women, although virtually conveyed to the state.

One of America's foremost sculptors has been chosen to execute the work. His composition represents an army divided in two wings, mounted and afoot, following the contour of the mountain. Pressing over the crest and keeping to its right will be the main body composed of cavalry, infantry, and artillery. At one side of this, rounding the monolith, will appear the other force headed by a brilliant group of horsemen consisting of the figures of Lee, Stonewall Jackson, "Jeb" Stewart, the Johnstons, and probably other great southern leaders of the '60s. This granite army, carved in full relief, will extend across the side of the great rock for roughly 2,000 feet. The horsemen will doubtless average between 45 and 50 feet in height, although these and the former figures are merely approximate estimates. There will be altogether some 1,200 separate portraits, each uniformed in the gray of the granite. It is possible that nearly all of these figures will represent men who actually fought for the South.

At the base of the mountain immediately beneath the statues of the southern leaders, and hidden from general view by a forest, a chamber 60 ft. deep and 200 ft. long will be excavated. This room will be used as a meeting place and depository by the Daughters of the Confederacy. Extending in front of it will be a colonnade of massive pillars, each typifying one of the Confederate states. Incidentally this raises an interesting point. Eleven states seceded in '60 and '61. Troops, however, were furnished to the South by Kentucky and Maryland, both of which remained in the Union. Because of this service they are now looked upon, at least by those promoting the monument, as Confederate states and will therefore be represented in the memorial.

Briefly this is the sculptor's own conception of the work, certain details of which, it is understood, are yet to be determined. The first step which the artist plans to take in executing the work, which will keep a large force of men busy for eight or ten years, is interesting. It represents the task of locating the frieze on the mountain side. This must be done with consideration for the lighting and structure of the hill. To simplify it, the sculptor plans to construct a studio, 100 ft. in length on the mountain's axis, nearly a mile from the base. This building will be provided with a window on the mountain side of sufficient size to permit him to see from the opposite wall the whole area of the hill which it is purposed to carve. The pane will be cross-lined and the composition drawn upon it to scale. By taking a step to one side or the other, the artist will be able to shift the outlined design to various parts of the mountain, while by moving to and from the window the size of the diagram can be reduced or enlarged, and the location and size of the work determined with little trouble.

The Spirit Manifested by the South and the Sacrifice Made by It during the Rebellion are Planned to be Commemorated by a Memorial Unparalleled in the Sculptural World. The Army of the Confederacy, Represented by the Figures of Some 1,200 Men, Many Mounted, is to be Chiseled in the Façade of Stone Mountain, near Atlanta. An Idea of the Stupendousness of This Undertaking is Given Herewith. The Columns of Soldiers will be Cut in Full Relief, as Pictured Above. At the Base of the Mountain will Be a Colonnade, Each Pillar Symbolic of a Confederate State. In the Middle of the Page is Shown a Cross-Lined Studio Window, Such as will be Used by the Sculptor in "Locating" His Work upon the Mountain Side

POWERFUL PHOTOGRAPHIC LAMP WITH BLUE BULB

A new electric light designed especially for photographers has as its essential feature a 1,000-watt metal-filament lamp with a bulb of blue glass, which reduces the luminous intensity of the light without affecting its actinic qualities, that is, without affecting the rays which produce the chemical changes essential to photography. These rays are blue-green, blue, violet, and ultraviolet. The result is a slightly bluish light, appearing almost white, having only one-third the luminous intensity but practically the same actinity as the clear 1,000-watt bulb. The lamp is mounted on a tall metal standard, on which it can be adjusted to the desired height. The frame also supports a diffusing screen. The bulb is set in a reflector.

The Blue Bulb of This Lamp Lessens Its Intensity

WYOMING HILLS FOUND RICH IN POTASH CONTENT

In view of the serious shortage of potash at the present time, it is interesting to learn that an abundant store of this much-needed mineral has been found in the Leucite Hills, a short distance northeast of Superior, Wyo. These hills are composed largely of igneous rocks of a peculiar character, which for some time have been the subject of considerable scientific attention. According to the Geological Survey it has been found that the formation is remarkably rich in potassium salts, holding approximately 197,000,000 tons of the product. While there is little probability of its immediate utilization, it is considered likely that some process can be worked out for extracting it which will be sufficiently cheap to warrant eventually the commercial exploitation of the mine.

FIRE RUINS CANADA'S PARLIAMENT BUILDING

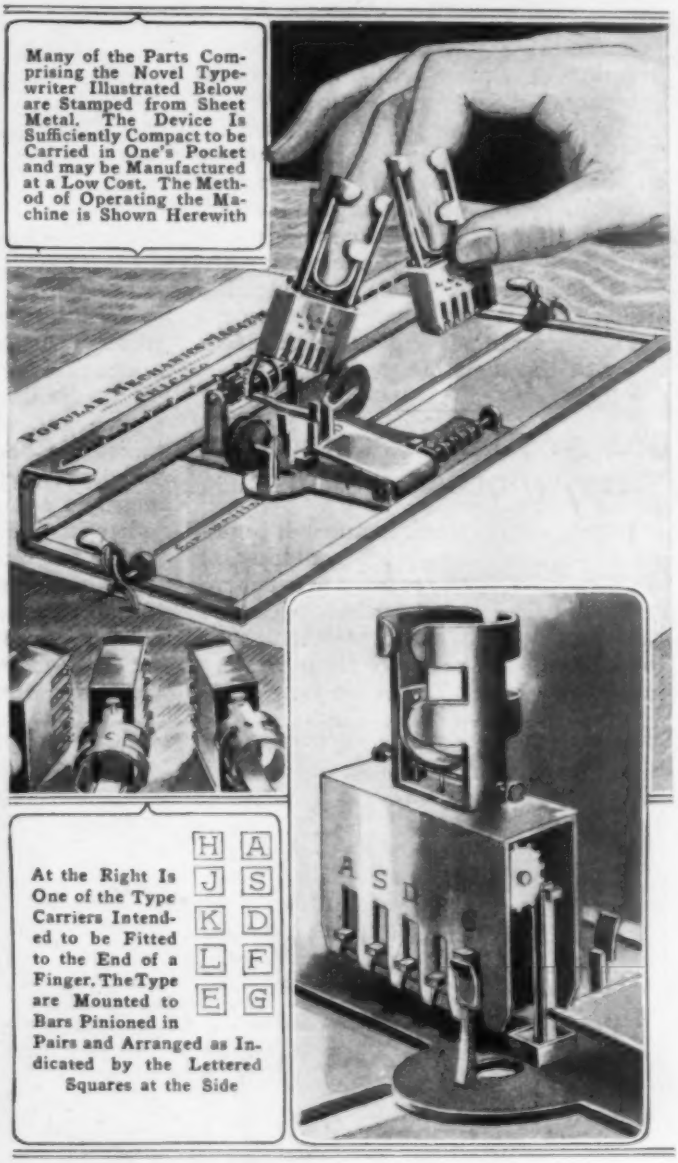
THIS shows the smoldering ruins of the Canadian parliament building at Ottawa, which on the night of February 3d was destroyed by fire of questionable and rather suspicious origin. The magnificent structure was one of a group of government buildings and contained a large collection of splendid paintings as well as valuable documents which were lost. The fire broke out in a room adjacent to the chamber occupied by the house of commons, which was in session at the time. Six lives were lost and several million dollars of damage done.

POCKET-SIZE TYPEWRITER OF QUEER DESIGN

Curious ideas are embodied in a cheap typewriter of pocket size recently patented by a Minneapolis inventor. The machine weighs only about two pounds and can be produced at small cost. Besides performing the ordinary functions of a typewriter it can be used on ledgers and similar record books. It has no platen, keyboard, nor heavy parts, and differs in almost every particular from the usual form of construction.

The machine is so designed that most of it can be stamped from sheet metal. It writes upon paper laid flat on the top of a desk or table. A metal plate, slightly broader than business stationery and held in position by a number of sharp pins fixed in its under surface, comprises the base of the machine. Extending longitudinally across this is a slot through which one line of typed matter is visible to an operator. Flanges turned up at the front and back of the base plate hold the carriage, which moves on four rollers, in proper alinement. In the middle of this carriage is a small, square hole, over and around which is a hopper-shaped piece with inclined walls that guide the type into it and into contact with the paper.

Unlike the usual arrangement, the type are mounted to short bars held in carrying devices designed to be fitted to the first three fingers of each hand. Several of these type bars are in each of the carriers and geared together in pairs. On the outer face of each there is a projecting stud. When one of these is rested on top of a post, provided adjacent to the hopper on the carriage, and pressure is applied by striking down with a finger, the pinion



Many of the Parts Comprising the Novel Typewriter Illustrated Below are Stamped from Sheet Metal. The Device Is Sufficiently Compact to be Carried in One's Pocket and may be Manufactured at a Low Cost. The Method of Operating the Machine is Shown Herewith

At the Right Is One of the Type Carriers Intended to be Fitted to the End of a Finger. The Type are Mounted to Bars Pinioned in Pairs and Arranged as Indicated by the Lettered Squares at the Side

is rotated and the opposite type bar driven down, impressing its character upon the paper.

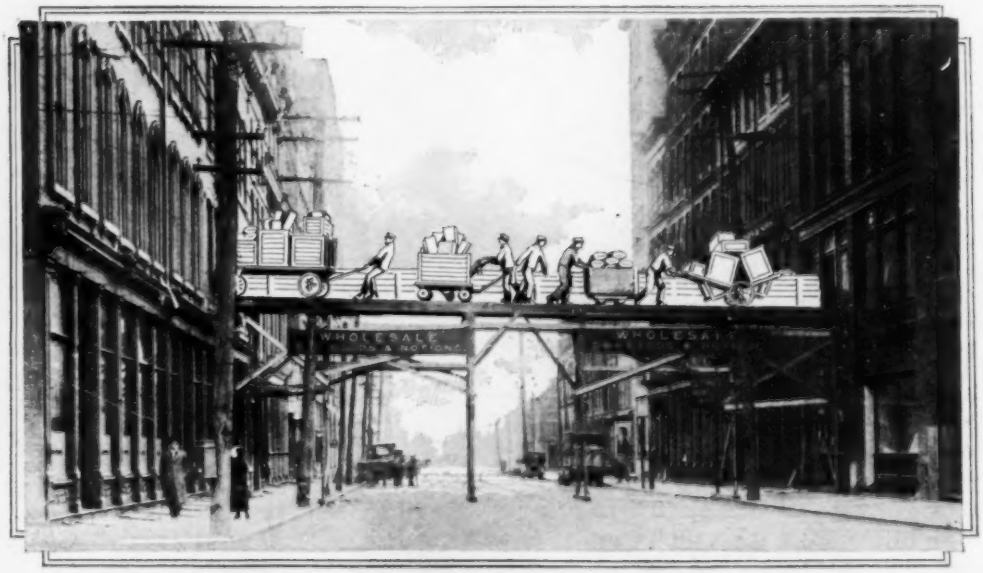
The movement of the carriage, like that of other typewriters, is automatic. It is stepped along one space at a time as the carriers are lifted after type has been selected and projected. The depression of a plate will likewise cause the carriage to space. Instead of the ordinary ribbon, an inked pad is used. This is kept at one side of the machine so that an operator can ink the type frequently. Line spacing is accomplished by a lever arrangement which moves the whole device the proper distance down a sheet of paper, instead of sliding the latter upward. It would obviously be impossible to write speedily with the machine.

ODD MOVING PLAN ADOPTED BY WHOLESALE HOUSE

In moving its stock to another building a wholesale dry-goods company, at Wheeling, W. Va., recently pursued an unusual scheme in order to expedite the work. The structure which it abandoned is situated immediately across the street from the new location. This convenient circumstance prompted the construction of a temporary bridge, to connect the second-story windows of both buildings, over which the goods could be carried on trucks. The plan proved successful, for it saved the time and labor which otherwise would have been consumed in loading and unloading wagons and lowering goods to the first floor in one structure and elevating them to the second story in the other one.

RICE-LAND CHECKER BUILDS LEVEE IN ONE OPERATION

With the assistance of a caterpillar tractor, 20 miles of levees, averaging about two feet in height, can be thrown up in one day by a grader designed as a rice and alfalfa-land checker by a California agriculturist. A trailer, which forms the carriage of the implement, is triangular in shape and provided in the middle with a windlass which permits the adjustment of two long scrapers. These have a wide spread, and are held by heavy arms hinged to the opposite sides of the vehicle. Each consists of three planks, the lower one tilted inward and faced



The Stock of Goods was Moved across the Street from One Building into the Other on Trucks Operated on the Temporary Bridge

Close View of the Grader, Showing Its Construction. The Machine Throws Up a Two-Foot Levee at One Operation While Traveling Two Miles an Hour

with metal plates, bolted together rigidly. Because of its wide angle, the grader is able to build a good border in one operation. This, of course, is done after the land has been plowed and harrowed. In checking rice land, the acreage is divided into blocks of about 10 acres which are margined by low embankments. This is done to restrict the water to definite areas when the land is periodically flooded. The tractor used with this grader travels about two miles an hour, which is sufficient to check a very large acreage of rice land in a day.

NOVEL BODY OF MOTOR CAR USED AS DARK ROOM

A motor truck, the body of which is a mammoth reproduction of a newspaper camera, has recently been put into service by a Philadelphia daily both as an advertising feature and as a saver of time for its photographers. The big camera has what appears to be a lens projecting from its rear end; large thumbscrews, such as turn films and adjust the focus, project from the sides; what appears to be a hood is fastened to the top. With the aid of a ladder a photographer in this big camera can mount to the top of the truck through an opening surrounded by the hood. At this elevation of 13½ ft. excellent photographs often can be secured while competing photographers are still searching about for means to get themselves and their cameras above the crowd. This motor-truck body is light-proof, and is fitted up as a developing room so that films or plates may be developed and prints made during

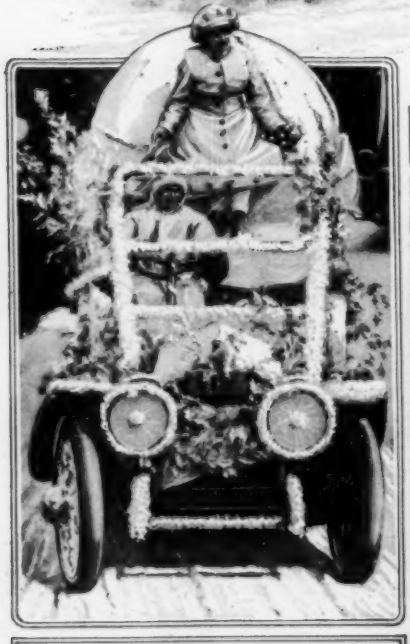
The Cameralike Body of This Car Is a Fully Equipped Dark Room, Which Frequently Saves Newspaper Photographers Valuable Time by Enabling Them to Develop and Print Exposures While Returning to the Office. The Roof Serves as a Platform from Which to Take Photographs

the return trip to the office, thus effecting a saving of time that means much to a newspaper.

¶Carnegie Institute, Pittsburgh, is to have a new field house, the basement floor of which will be on a level with a new athletic field; the roof, 60 ft. above, will constitute a bridge connecting the campus and a city street.

GAY, FESTIVE SPIRIT REIGNS AT ST. PAUL

Thousands of Persons Took Part in Outdoor Sports Indulged in during the 10-Day Winter Frolic at Minnesota's Capital. Above is Shown the Start of a Whippet Race and at the Left a Carnival Group Engaged in a Game of Pushball



The Festival was Held during the Latter Part of January and the Beginning of February, and Drew Large Crowds of Visitors. Above Appears One of the Decorated Cars Entered in the Winter Parade. At the Right Is a Street Scene Which Indicates How the Gala Spirit Gripped the City

THROUGHOUT CARNIVAL OF WINTER SPORTS

Toboggan Slide, of Which There Were Several in Different Parts of the City, Showing State House in the Background. It was Brilliantly Illuminated at Night

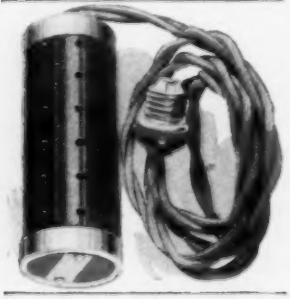
An Ice Wall Surrounded Hockey and Skating Rinks, Established on an Island in the Mississippi, Where International Prize Contests were Held. This Shows the Amateur Champion Fancy Skater of the Northwest Doing a Turn with His Partner. Curling, and Skiing Were Other Sports Observed

TANK AND TOWER ARE BUILT OF REINFORCED CONCRETE

Reinforced concrete was used some time ago in constructing a water tank and tower at a country place on Galveston Bay, near Seabrook, Texas. The structure rises to a considerable height and has already proved its stanchness by withstanding the hurricane which swept the gulf coast last August and razed all but two dwellings in Seabrook. The tank is perfectly water-tight and during months of service has given complete satisfaction. The expense of erecting it was only about one-half as much as that necessary to construct a steel structure of approximately the same size. The pipes leading to and from the tank extend through the columns forming the tower.

CAR ENGINE AND RADIATOR KEPT WARM BY HEATER

In an attempt to ameliorate the difficulty experienced by northern motorists who keep their cars in unheated garages during the winter months, an electric heater has been developed which prevents a radiator from freezing and keeps an engine warm so that it may be readily started on cold mornings. The device is approximately the size and shape of a small dry cell and weighs less than a pound. It is intended to be placed beneath the hood of a car and its cord attached to any lighting socket. The heat it radiates is sufficient protection, under average conditions, for the pipes and radiator. It burns 100 watts and is provided with a durable heating element housed in a perforated shell.



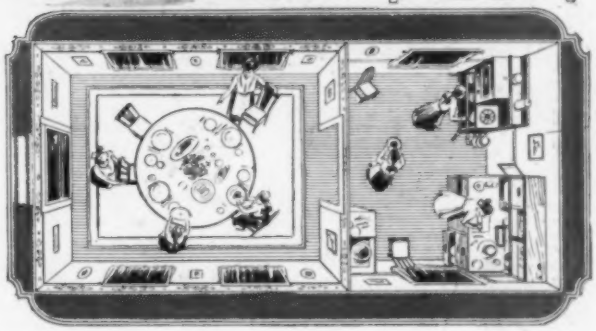
LOW OPERATING CHARGE AIM OF NEW ELECTRIC ARC

Experiments have been made by illuminating engineers in an attempt to develop an arc lamp which would decrease the operating cost of the present types requiring regular trimming and cleaning. That the work has been rewarded by encouragement at least is indicated by current reports. An experimental lamp has been designed which consists in part of a crystalline chamber, in the middle of which, between a pair of tungsten electrodes, is an arc. The electrodes are slightly more than an eighth of an inch in diameter and partly surrounded by an insulator intended to keep the arc reasonably close to their ends. This refractory member is furthermore meant to help keep the electrodes at a high temperature. A tungsten rod holds the upper of these to an iron core which is safeguarded against corrosion by a glass shell incasing it. The current is carried from this electrode to the upper seal by a spiral of tungsten. The arc is ⅛ in. in diameter, of tubular form, and is said to be very stable. It is surrounded by a vapor of titanium bromochloride which gives a white light of high luminosity.

HOUSEHOLD ARTS TAUGHT IN MODEL HOUSE ON WHEELS

That the fundamentals of domestic science may be more practically and interestingly taught in rural regions, a Kentucky county superintendent of schools has constructed a model house of two rooms which is mounted on a wagon running gear and is transported

Left: A Model House That is Transported from One Kentucky Rural School to Another to Aid in Teaching Domestic Science. Below: A Drawing Showing the Completeness of the Furnishings of the Dining Room and Kitchen. A Class of Six can be Accommodated in the Structure at One Time



from school to school. The model will accommodate a class of six pupils at a time, which is ample for the needs of the average country school. A demonstrator accompanies the exhibit and in the course of from one to three weeks, which is the average stay at a school, is able to teach a good deal of simple domestic science. Removable steps lead from the ground to the screened door at the end of the structure. The first of the two compartments measures 7 by 9 ft. and is furnished with a dining-room table, chairs, rugs, curtains, etc. The other room, the kitchen, is 6 by 7 ft., and contains a three-burner oil stove with an oven, a kitchen cabinet, a sink with air-pressure water supply from a tank, and a suitable set of kitchen utensils. The floors are of hard wood, and the inside walls of fiber board tastefully painted. An invitation is extended to the residents of each district, particularly the young people, to inspect the model.

INDIVIDUAL SHELTERS USED TO PROTECT ANGORA KIDS

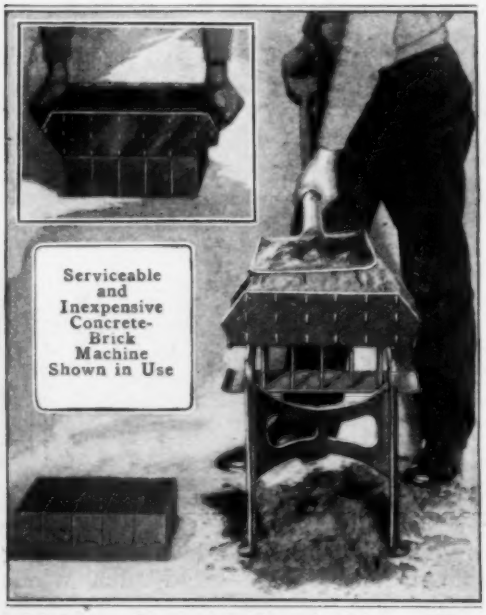
On the angora-goat ranches of the Southwest large numbers of small, tentlike shelters, made of two wide boards nailed together at right angles, are to be seen arranged in rows within the inclosures where the kids are cared for. These low structures form individual shelters for the young animals, shading them from the sun during hot weather and also shielding them from severe, sand-laden winds which are not at all infrequent. The female angora goat is noted as an indifferent mother, and because of this, raisers as a rule make special provisions for the care of the young, as indicated here. When born, the kid is usually smaller than might be expected. It grows rapidly, however, and reaches maturity within a short time.

Board Shelters for Angora Kids on Goat Ranch in New Mexico

¶ The body of a new automobile model is orange colored and the covers for the upholstery are vertically striped black and white.

CEMENT BRICKS ARE MADE BY HAND APPARATUS

Cement bricks may be produced easily and at minimum expense by the use of a small, inexpensive hand machine



which has been developed of late. The apparatus turns out five sharp-edged bricks at a time and may be made to produce from 1,500 to 2,500 a day. It is especially serviceable for farmers, and others, who have buildings to erect and who frequently have sand available on their own places. In cases of this kind the bricks are produced at a cost of little more than the cement used in their manufacture. The mold is made of sheet metal, and when desired, may be fitted with special faceplates so that the finished product will have a stone finish. The machine is supported on a metal standard, and after being properly filled with concrete is turned upside down and lifted to a floor. By then drawing up handles provided at either side, the bricks are released.

¶Tourists motoring through Salt Lake City are invited to camp in one of the city's parks. Gas ranges have been installed there so as to make camp fires unnecessary.

MAKING NIGHT SNAPSHOTS WITHOUT FLASH LIGHTS

With the aid of an electric illuminating outfit of quite recent invention instantaneous photographs can easily be made at night without employing flash lights. A blue-colored incandescent lamp of 1,000 cp. is mounted in a large bell-shaped, porcelain-lined reflector. This throws the light, increased by reflection to about 3,000 cp., on a circular screen 30 in. in diameter which is held in front of the housing. The cloth used in this device diffuses the rays so that there is good illumination for photographic purposes, but no intense glare projected in the face of a subject. The apparatus may be connected with an ordinary house-lighting circuit and pictures made with a shutter timed at a half second. The lamp house is supported on a tubular stand which may be adjusted to any height between three and nine feet.

MILK SHAKER RESEMBLES SHRAPNEL SHELL

A novel reminder of the present war is a milk shaker which is designed closely to resemble a shrapnel shell. The article is of highly polished steel

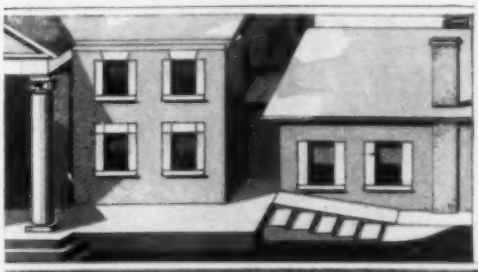
This Beverage Mixer, Resembling a Shrapnel Shell, Is of Highly Polished Steel and Brass: The Holder and Glasses Fit into the Lower Half of the Shell

and brass; its upper half fits snugly into the lower half. An attractive metal frame, which holds four small glasses, one above the other, accompanies the mixer. The frame and glasses are designed to fit into the lower section of the shell when not in use. The upper half only is used for mixing beverages. To fill it, the entire cap should be removed. After the ingredients have been shaken, instead of removing the entire cap, the tip may be taken off separately. Immediately below the small opening so formed is a strainer through which the liquid may be poured. If ice has been used it is retained by this strainer. The article is very ornamental for a buffet or sideboard.

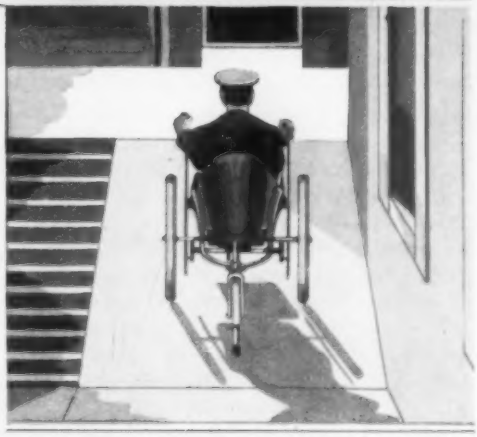
¶As a substitute for northern winter coasting, American children in the Panama Canal Zone slide down grassy hillsides on greased barrel staves.

MANY DESIRABLE FEATURES IN NEW CRIPPLES' HOME

A crippled children's home and educational colony in which are combined a number of features that will make it one of the most serviceable and up-to-date institutions of its kind in the country is to be erected in Detroit as a result of a recent campaign for $200,000. The aim of those laying out the plans for this colony has been to foster home atmosphere and to eliminate as much as possible all suggestions of institutionalism without impairing the efficiency of the home.



Above: Near View of One of the Buildings of the Proposed Crippled Children's Home in Detroit, Showing Ramps and Steps
Below: The Children will Live in "Families" in the Cottages. Trades will be Taught in One of the Two Schools



One of the Ramps, Adjoining the Steps, Which will Be a Feature of the Entrances to the Buildings

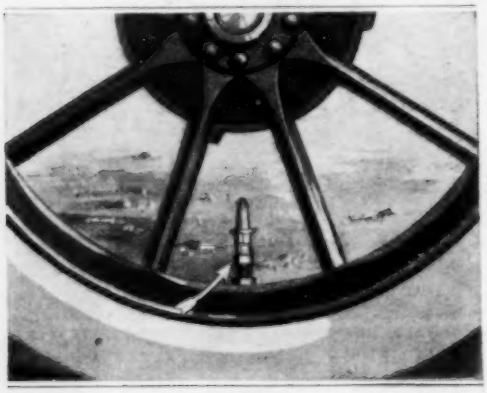
Instead of erecting one large building, a group of 13 smaller ones will be built in the midst of lawns and gardens comprising a 40-acre plot. This group will include eight cottages, each

of which will accommodate 12 children, a housemother, and a nurse. For the sake of those using wheel chairs all the rooms will be on one floor, and there will be ramps at all the principal entrances. Each of the eight "families" will have its meals served in its own dining room. The food, however, will be cooked in a central kitchen and brought on carriers through subways to the various cottages. A central two-story building will be used for administration purposes.

It is the aim of the institution to teach each child self-support despite his or her physical handicaps. Two of the buildings will be devoted to school purposes, one for the study of the common branches and the other for manual training, trades, and arts. Set apart from the rest of the plant will be an isolation hospital.

CAP FOR TIRE VALVE ACTS AS PRESSURE GAUGE

An automobile tire valve which acts as a safety valve has been patented. The purpose of the invention is to

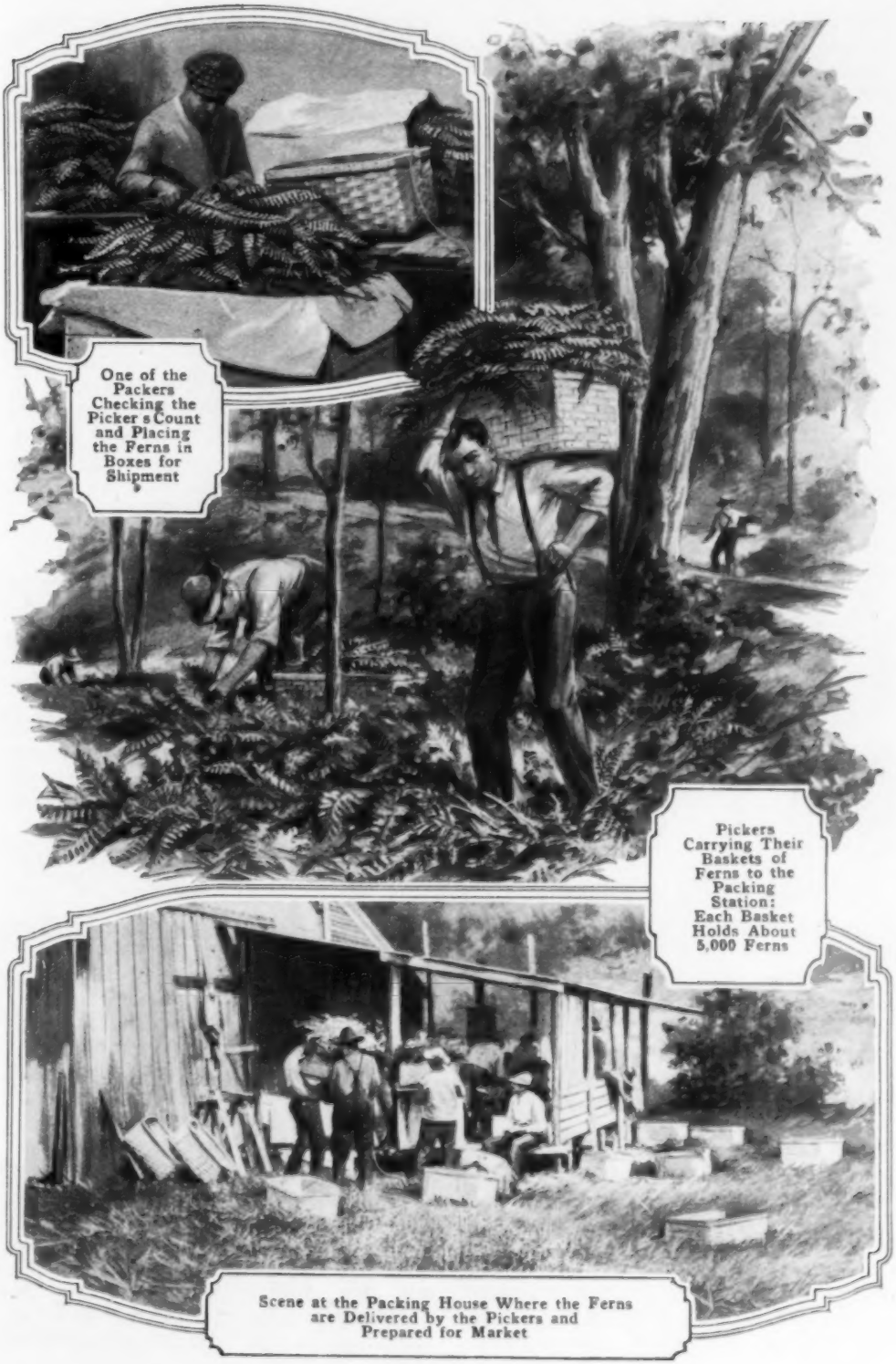


This Tire Valve Automatically Relieves Pressure in a Tire When on Account of Weather or High Speed the Pressure Becomes Too Great

relieve a tire automatically of excessive pressure caused by weather conditions or high speed. This valve is in reality an especially designed cap which fits on any standard tire-valve stem in place of the ordinary dust cap. A rubber gasket is used to make the connection air-tight. The valve can be set for any desired pressure, and when changing conditions increase the tire pressure to the point designated, a sufficient quantity of air will be released automatically to bring the pressure down. The adjustment can take place while the car is running. The device by its operation tends to prolong the life of a tire and to prevent accidents resulting from blow-outs which occur while running at high speed.

WHERE THE FERNS SOLD BY FLORISTS COME FROM

An answer to the inquiry sometimes made as to where all the ferns sold by the florists of the country come from, is indicated by the business of one company operating in the East, which regularly employs during the season more than 200 men for gathering the ferns, and which handles annually something like 50,000,000 ferns. Ferns, unlike most of the plants handled by florists, grow wild and are seldom cultivated artificially on a large scale. For this reason the work of gathering them from the moist and shaded forest lands forms one of the important features of the business of supplying the market. The actual work of gathering is not so attractive as it would seem in view of this condition. Each picker is equipped with a basket large enough to hold 5,000 ferns, and it is his purpose to fill this basket and turn it in to the packing station twice each day. The basket with its contents weighs about 40 lb., and must be carried on the shoulders of the picker over rough mountain paths, usually for a distance of several miles. In gathering the ferns the picker breaks them off near the ground and counts and ties them into bundles, each containing 100. At the packing station they are packed into boxes holding from 5,000 to 6,000, and then shipped by express to a storage warehouse in which a temperature of 28° is maintained. As needed they are taken from the warehouse, sorted, repacked, and shipped to florists in various cities. About 10 per cent of



One of the Packers Checking the Picker's Count and Placing the Ferns in Boxes for Shipment

Pickers Carrying Their Baskets of Ferns to the Packing Station: Each Basket Holds About 5,000 Ferns

Scene at the Packing House Where the Ferns are Delivered by the Pickers and Prepared for Market

all the ferns gathered are waste on account of breakage and other defects. The pickers are usually paid 20 cents a thousand for gathering and delivering the ferns to the packing stations.

WINDMILL SURMOUNTS SILO AND WATER TANK

In constructing a combination silo and water tank on his farm, an Iowa agriculturist in the vicinity of Campbell made provisions to use the structure as a windmill tower. The economy of making the building serve three functions instead of merely one is quite apparent. Silos which support water reservoirs are not uncommon, but the erection of a windmill at the top carries the scheme a step farther and likewise eliminates the expense of providing a special elevation for this purpose alone. The structure is 12 ft. in diameter and built of tile. The part reserved for the ensilage extends to a height of 36 ft. and carries the tank, which is 12 ft. in depth and made of concrete. The roof is also of concrete construction and forms a substantial base for the windmill, which rises about 10 feet higher.

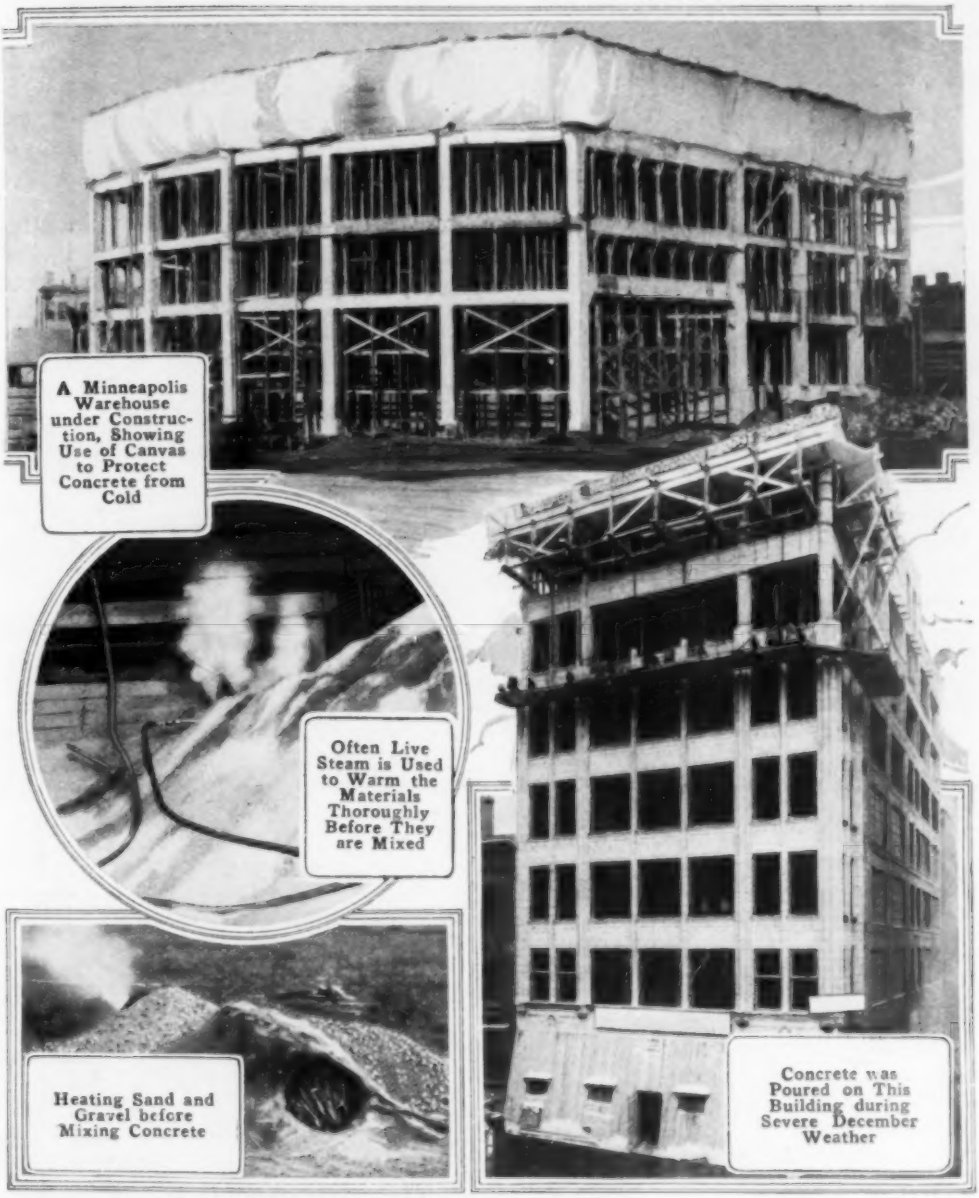
TRADE ROUTE CHANGED BY SURVEY IN SULU SEA

As a result of a survey recently made by the Coast and Geodetic Survey a new route has been charted through the Sulu Sea, which shortens by 200 miles what was formerly considered the safe route. The Sulu Sea lies to the southwest of the Philippine Islands, between the islands of Palawan and Mindanao on the northwest and east sides, respectively, with the northern end of Borneo bordering it at the southwest. It covers an area of 50,000 square miles and is so filled with uncharted reefs and sand quays that few navigators venture on it, though it lies in a direct path extending from ports in the southern Philippines to the South China Sea and thence to the Suez Canal. Late in 1914 the wreck of two richly laden vessels in this sea proved the wisdom of the underwriters' refusal to assume liability for vessels crossing it.

The European war, however, made a route in this unfrequented region very desirable because its use renders merchantmen of warring nations less open to attack than when they are on busier lanes of travel. The new route answers the demand. A surveying party on the "Pathfinder" took soundings at frequent intervals and a track from 10 to 15 miles wide and 260 miles long was practically completed. The old course used by the Royal Spanish Mail required five changes of course, while the new route has but two. Two large steel towers with flashing acetylene lights which can be seen 14 miles have been placed at the turning points by the Bureau of Lighthouses. These form a link in a chain of lights extending from Iloilo to Balábac Straits.

WORKING IN COLD MONTHS WITH CONCRETE

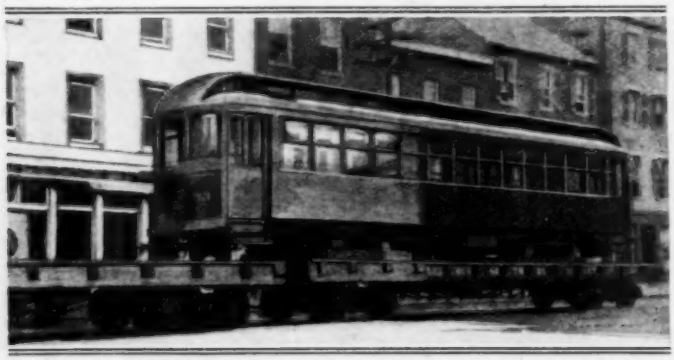
Although nearly every one residing in northern cities is accustomed to seeing concrete construction carried on in the coldest part of winter, there are doubtless some in other parts of the country who still consider that such work must be executed during moderate weather. The expense of closing down large plants and suspending building operations for periods of several months each year, as well as other things, has caused many contractors to devise ways of preventing this leakage and taking advantage of the abundant supply of labor available at such a time. It is interesting, there-


A Minneapolis Warehouse under Construction, Showing Use of Canvas to Protect Concrete from Cold
Often Live Steam is Used to Warm the Materials Thoroughly Before They are Mixed
Heating Sand and Gravel before Mixing Concrete
Concrete was Poured on This Building during Severe December Weather

fore, to notice that during the past two years nearly all of the large reinforced-concrete structures erected at Minneapolis have been put up during the winter. By taking precautionary measures to protect fresh concrete from being injured by low temperatures, a contractor is able to carry on his work in the winter as well as in other seasons, thus keeping his organization together and lowering his overhead. In mixing concrete when the weather is cold, the water and aggregate are heated, the latter by means of steam pipes or inclosed fires. After the material has been poured into the forms it is protected with straw and canvas coverings and frequently kept from freezing by the additional use of a large number of salamanders.

CAR CARRIED TO JURY IN DAMAGE SUIT

An unusual exhibit produced in a law suit is that of a trolley car mounted on flat cars and shipped to the place of trial by the defendant, which was a Virginia electric road. The plaintiff alleged that he was injured by the trolley of this car falling on him. To disprove this charge the car in question was brought twice to the county seat where the case was being tried, that the jury might see it and judge the testimony accordingly.



To Disprove Charges in a Damage Suit a Virginia Electric Road Shipped This Car to the Place of Trial so That the Jury might See It

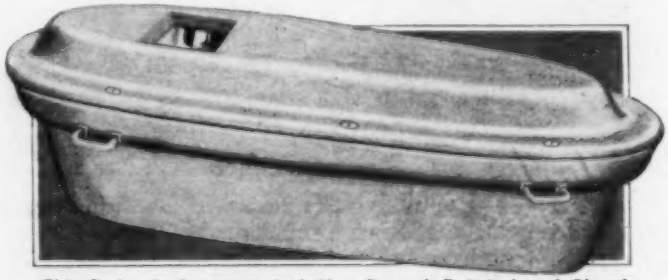
DRIFTWOOD CATCHER BUILT LIKE A FENCE

A driftwood catcher has been constructed across the White River, Wash., which consists of a row of 26 concrete rectangular blocks each set diagonally to the line of the stream. From each of the upstream faces of these blocks project nine eyebolts by which as many steel cables are suspended between the blocks. Three spacing rods divide each section of this "fence" into panels. Diagonal wires give them added strength. A total of 18,000 ft. of cable was used in constructing this barrier, which is for the purpose of preventing log jams on the river that cause the water to flood over adjacent farms.

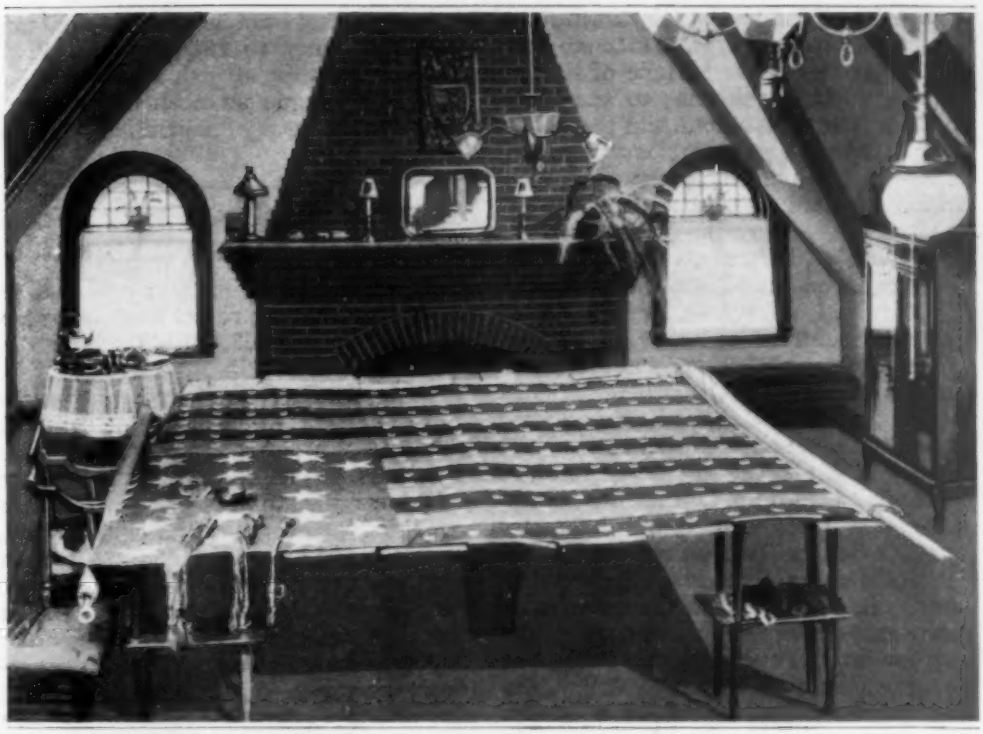
¶ Phonographic records of Emperor Franz Joseph's voice have been made and are being sold for the benefit of a pension fund.

CLAY CASKET PRACTICALLY INDESTRUCTIBLE

A casket, constructed of clay, which, it is said, will withstand the ravages of time indefinitely and is impervious to water, air, and vermin, has been put on the market. The only materials, other than clay, used are metal for the handles, cloth for the lining and covering, and a pane of plate glass set in the cover, through which the interior may be viewed. The handles are molded on when the coffin is shaped. After being molded the clay is burned, polished, and glazed. A flange on the cover fits closely into a groove in the edge of the lower portion, making it possible to seal the casket hermetically with cement. The handles may be finished with any metal desired, and likewise the cloth for the trimming may be of any chosen quality. When trimmed this casket resembles the ordinary coffin except that the ends are less angular.



This Casket is Constructed of Clay, Burned, Polished, and Glazed. It is Said That It will Last Indefinitely



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General Grant's Flag Undergoing Repairs: The Small Squares of Paper are Basted at Intervals of Six Inches. As the Work on Different Sections of the Banner is Finished the Respective Squares are Removed. This Shows at a Glance the Progress Which has been Made

PRESERVING GRANT'S BANNER AGAINST DISINTEGRATION

In order that it may be preserved for future generations, a flag which waved above General Grant's headquarters during the latter part of the Civil War is being rejuvenated in the same manner as was the original "star-spangled banner" a year and a half ago. When Lee surrendered, the flag was presented by General Grant to one of his staff officers. Some years ago it became the property of the state of Massachusetts, and while reposing in the state house gradually fell into a bad condition. This caused it to be turned over to an eastern woman who has gained a reputation as a restorer of old flags. The process of preserving it consists in backing the banner with Irish linen of a certain weave. Special stitches employed to baste it to the reinforcement give the flag a honeycombed appearance when closely examined. The thread used in doing this work is dyed to match the faded colors of the banner.

NEW PRINTING PROCESS IMITATES ENGRAVING

A device that produces printing which it is difficult to distinguish from engraving, and at much less cost than engraving, is now on the market. By this method printing is done from ordinary type or cuts with especially prepared ink. While the ink is still moist

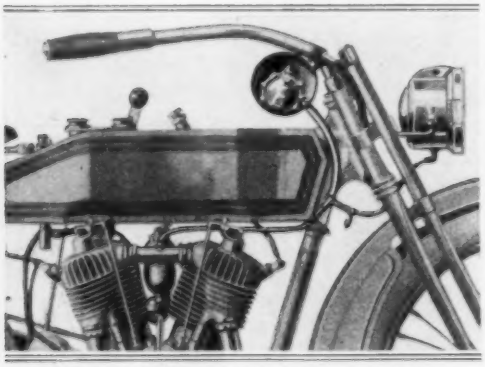
By Baking a Powder into Ink After It Is Printed and While Still Moist, This Machine Produces Lettering That Closely Resembles Engraving

a powdered compound, the formula of which is a trade secret, is mechanically distributed over the surface of the letters, a portion adhering to the moist ink. In that moist condition the sheets are placed on a wire carrier and passed through an oven between two electrically heated asbestos plates, 18 in. long, the sheets coming within ¾ in. of the heated surfaces. By this means the powder is baked into the ink, forming a raised, glossy surface that very closely resembles ordinary engraving.

The heating element used in this machine consists of 12 resistance coils which attain the desired heat in a very short time. The temperature of the oven and the speed of the carrier are regulated according to the thickness of the paper used. Sheets of thin paper can be dried as fast as they are run off the press and are ready for delivery at once. In this respect the process is more expeditious than ordinary printing, for ordinary printed matter has to be given time in which to dry. The new machine is operated by a 1/20-hp. electric motor and may be attached to any power socket.

MOTORCYCLE ENGINE PRIMED WITH ACETYLENE

A device recently invented makes it possible to use acetylene gas for priming the engine of a motorcycle as readily as for supplying light. It consists simply of a pipe, leading from the gas generator, which divides into two branches, one branch going to the lamp and the other to the engine. Each branch is equipped with a valve so that the flow of gas as needed for either purpose is easily controlled by the driver.



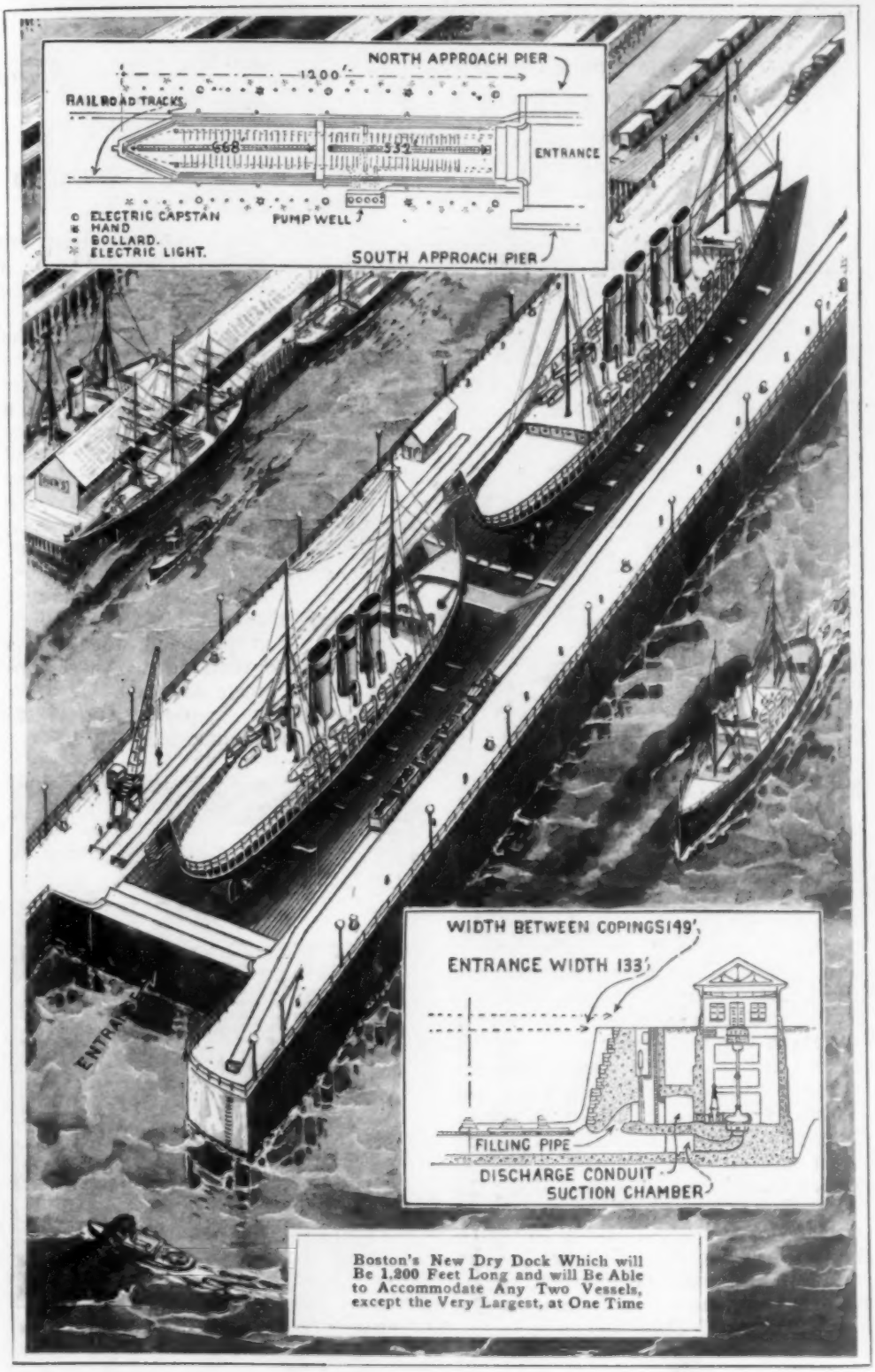
Pipe Connection for Supplying Acetylene Gas to the Lamp or Engine of a Motorcycle

BOSTON'S GREAT DRY DOCK NOW UNDER CONSTRUCTION

Work is now under way on Boston's new dry dock, a project that will cost, all told, about $3,250,000. The dry dock will be 1,200 ft. long over all, making it one of the largest dry docks in the world and surpassing, it is said, any other in North or South America. Previous to beginning work on the structure itself, two years have been occupied with dredging a channel and, with the aid of bulkheads, filling in an area of several hundred acres, a large part of which now becomes available for industrial purposes. More than $500,000 has been spent in this preliminary work.

With the exception of a few of the very largest liners this dry dock will be able to accommodate any two vessels at one time. For the purpose of dividing it into two sections a special intermediate gate will be constructed 532 ft. from the entrance. The dry-dock closure will be effected by means of a floating gate, or caisson. The width of the entrance at the top will be 133 ft.; the depth over the sill at mean low tide, 35 ft., and at high tide, 45 ft. The width at the coping level in the body of the dry dock will be 149 ft. The capacity of the pumping plant will be such that the structure can be emptied in two or three hours, depending on the tide.

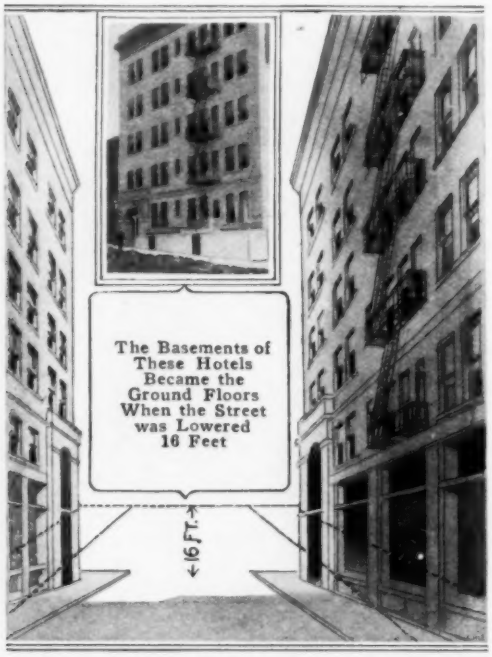
The foundation is of solid rock and the walls and floor are to be of concrete, the inner face of the walls being lined with granite. To prevent lifting by hydrostatic pressure the floor will be underdrained. The contract date for the completion of the work is August, 1918. This undertaking is one of a number of costly water-front improvements which have been added to Boston's shipping facilities.



Boston's New Dry Dock Which will Be 1,200 Feet Long and will Be Able to Accommodate Any Two Vessels, except the Very Largest, at One Time

BASEMENTS OF TWO HOTELS BECOME FIRST FLOORS

When two hotel buildings were erected opposite each other on a hilly Los Angeles street a few years ago,

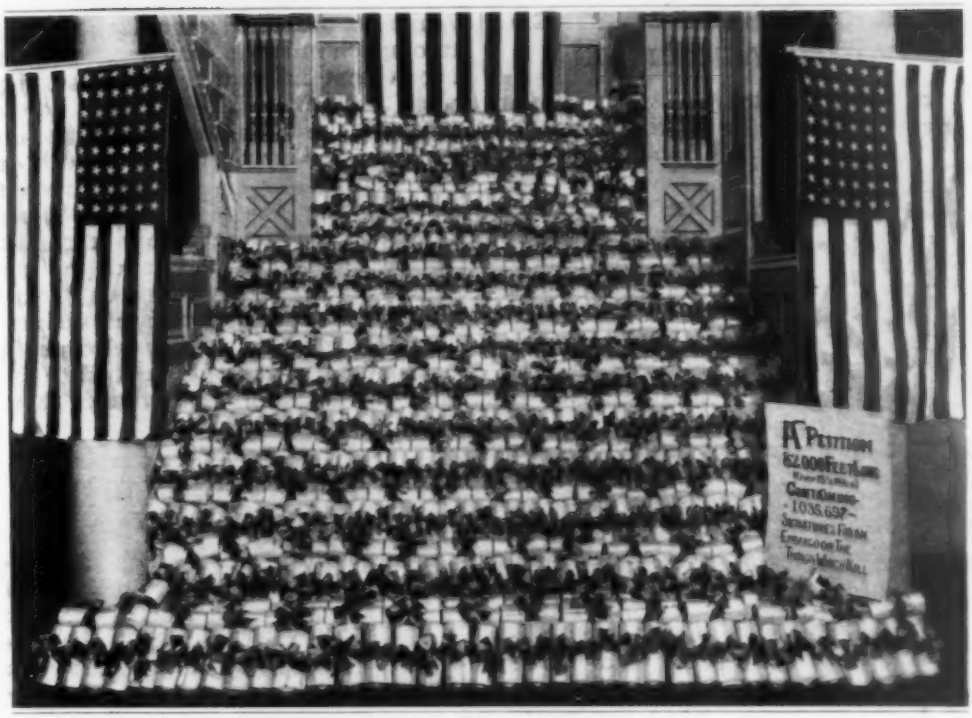


the owner had them designed so that they could be easily remodeled if the thoroughfare were ever graded to a lower level. To do this the foundations were sunk deep and the basements so arranged that they could with slight alterations be converted into ground floors. A short time ago the municipal authorities decided to make the cut and lower the street 16 ft. at this point. No sooner had the grading been commenced than the work of providing an additional story for each of the structures, by building down instead of up, was undertaken. A deep trench was excavated along the front of each hotel and the uncovered foundations faced with brick to match that above. Sections of the walls were torn out and plate-glass windows installed, while the work of changing the basements into lobbies was also begun. The ditches were inclosed as soon as they were dug, so from the surface there was little indication of the transformation going on beneath.

ICE-CREAM SODA PROVIDED EASILY IN THE HOME

For use in the home and elsewhere a miniature "soda fountain" has been devised which enables one to prepare carbonated beverages almost as readily as if provided with the facilities of the average soft-drink emporium. It consists of a small nickel-trimmed bronze valve, one end of which is fitted with a sharp-pointed stem. By means of special pliers this tip may be forced through the tin cap sealing an ordinary bottle of flavored soda. By then opening the valve and shaking the flask, the liberated gas forces the soda out with a characteristic fizz. This produces the froth for ice-cream soda and similar refreshments. When sufficient foam has been provided, the cap is lifted and the remainder of the contents of the bottle emptied. If plain soda is used, a sirup flavoring is required, but not otherwise.

The Puncture Tip of the Device is Forced through the Tin Cap of the Soda Bottle with Special Pliers, Permitting the Water to Flow Out



ARMS-EMBARGO PETITION LARGEST ON RECORD

WHEN a petition pleading that an embargo be placed upon all of the "things which kill" was recently sent to Congress, it represented a collection of the most voluminous documents of the kind ever received at Washington, so far as is known. If pasted together, it would have extended approximately 15½ miles in length. In all it bore the signatures of 1,035,697 persons, a very large proportion of whom are of German extraction. The illustration above shows the documents, each tied with red, white, and blue ribbons, arranged on a flight of stairs. The petition was delivered to the Senate and placed before the vice-president's desk.

PARROT OF STAINED GLASS A NOVEL TRANSPARENCY

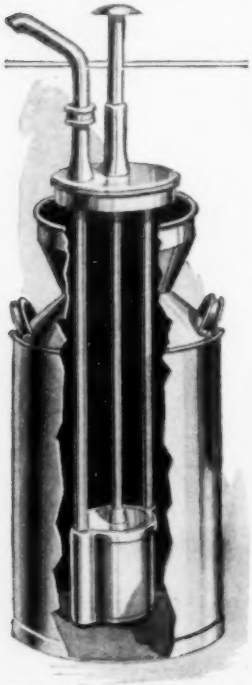
A parrot made of pieces of stained glass, leaded together after the manner of stained-glass windows, is a striking window decoration. The brightly colored bird is fastened to a wire loop, by which it may be hung from the center window sash. The bird shown is 27 in. long and the dominating colors are green, orange, and purple. Both as a transparency and with the light shining on it, but not through it, the novelty presents a very artistic appearance.

This Artistic Window Decoration is Made Up of Transparent Pieces of Stained Glass Leaded Together

¶It is reported that the searchlights used at the Panama-Pacific Exposition have been bought by Russia for war use, for which, on account of their great power, they are well fitted.

MILK DISPENSER DESIGNED FOR SODA FOUNTAIN

At soda fountains, and similar places, milk may be readily dispensed from large containers by the use of a special pump which has been introduced for this purpose of late. The device has a length of 26½ in. and is designed to extend to the bottom of an ordinary milk can. Near the top of it is a plate which covers the opening usually provided in a cabinet, and this remains in place when the pump is lifted out for one reason or another. The exposed part is made of plated German silver, the cup and plunger of block tin, and the rods of nickel silver. It is so arranged that it may be taken apart and sterilized regularly. When the plunger is depressed the pump draws from the bottom of a can. The capacity of the cup is 8 oz., and for large users of milk the convenience of the device is apparent.

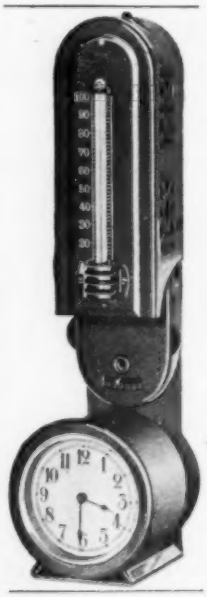


FLOWER-BORDERED ROADS IN REACH OF MOTORISTS

Organizations are being formed by women in different sections of the South, and other places, to promote a movement which has for its purpose the beautification of America's highways. It is the intention of these women to plant flowers of a hardy character along the roadsides in their districts, and convert what are now weed patches into banks of fragrant blooms. While well-directed organizations can accomplish much, a good suggestion of a somewhat different character is being given publicity. This amounts to an appeal to the individual motorist to do his share by procuring the seeds of plants suited for his respective region and planting them broadcast along country roads at the proper season of the year. If the thousands of car owners of the country would enlist voluntarily in a movement of this character, we could have flower-bordered roads from one end of the nation to the other within a comparatively short time.

THERMOSTAT ADJUSTS SELF TWICE DAILY

A thermostat, with which is combined a small eight-day clock, is so constructed that, at night, the thermostat pointer is automatically moved back to the night temperature desired, and again in the morning, at the predetermined hour, is moved forward for day temperature. Attached to the main shaft of the clock is a dial making one revolution per day; it is stamped with time graduations. An adjustable double hand, moving on this dial, is used in setting the automatic apparatus, about as an alarm clock is set. As the hand at the predetermined hour is brought to the top by the dial, it comes in contact with a small lever, tripping a mechanism that moves the thermostat pointer to the desired reading. In this way a twofold automatic variation in temperature is secured such as an ordinary thermostat does not provide.



RECREATION TOGS WITH SNAP FOR THE GIRL

Below: Effective Bathing Costume of Surf Satin Worn with Roomy Bloomers That Button at the Knees. The Tasseled Pompon Hat Adds a Pleasing Touch
Below Is a Comfortable Sport Suit of Light-Weight Wool Jersey Well Adapted for the Girl of Average Stature. The Collar and Cuffs are Trimmed with Leather
PHOTO BY UNDERWOOD & UNDERWOOD
Natty and Serviceable Is the Golf Suit at Top: The Sweater Is Green, Gold, and Brown Plaid with Scarf; the Skirt Is Rough Tweed. Tomboy Coat of Yellow Guernsey and Swinging Velour Skirt over Bloomers Give Camping Costume at Side Rare Dash of Style. Flannel Shirt, Woolen Skirt over Leather Trousers, and Boots Comprise Fishing Apparel at Right

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ELEVATED PLAYHOUSE BUILT IN CLUMP OF TREES

On the grounds of a summer home by Lake Huron beach at Sarnia, Ont., a children's playhouse has been constructed several feet from the ground in a cluster of trees. It is very neat in appearance, substantially erected, and a source of almost endless pleasure for the youngsters who make use of it. The house, a small shingled structure with overhanging eaves, is surrounded by a balustraded porch and supported at a height of 12 ft. on a platform firmly secured to the tree trunks. The interior is divided into two tiny rooms which are equipped with an adequate amount of miniature furniture, while small-paned windows on the different sides provide an abundance of sunlight.

Access to the Playhouse is Gained by a Ladder That may be Withdrawn When Desired

BINDING RARE OLD BOOKS IS INTERESTING ART

Among the less known arts, some of which are gradually commanding more attention in this country, is that of expert bookbinding. According to an eastern exponent of this profession, the work is not one to choose as a profitable means of livelihood. It is better suited as an avocation than as a business, and should be followed for art's sake and pleasure more especially than for pecuniary purposes. The reason for this is found in several things, as for instance the time one must spend in gaining proficiency, and likewise the amount of time that is consumed in working on a single volume. Before a person can attain noteworthy skill he must give, according to this authority, probably 10 years to hard, painstaking study and labor. Furthermore, it is not infrequent that a finely bound book represents two months or more of continuous work. The patrons for the most part are wealthy persons who own old, rare volumes. They wish these to be given rich and historically correct bindings. Also the books must be rejuvenated. Hard work, much time, and true skill are required to accomplish these things. At the outset a book must be taken apart. What are known as hinges are fixed to all of the plates it contains and these are then placed in a press. The book is rounded, backed, laced, edge gilded, and head banded. The leather is pared, washed with vinegar and warm water, polished, and made ready in other ways, for tooling. Altogether there are some 80 different processes involved in executing a fine piece of work. The tools used are all modern and frequently need to be made especially for separate books.

FIRST CASE OF RABIES IN ENGLAND IN MANY YEARS

Through the operation of rigid quarantine regulations and by the muzzling of dogs, England has been able to completely stamp out rabies. What is declared to be the first case since 1902 occurred recently in a dog that was being held in a six months' quarantine which the English law imposes on all canine pets brought into the country. It is said that Australia and New Zealand have never had any cases of rabies. Sweden, Norway, and Denmark are practically free from the disease.

Experiencing a Zeppelin Raid

By R. J. Bjurstedt

ON the night preceding that of the big September raid of Zeppelins on London there was a sort of scouting visit during which bombs were dropped in the vicinity of the Woolwich arsenal, five or six miles from the center of the metropolis. Motoring out with a friend to see the rather inconsiderable damage wrought in this vicinity, the writer was shown by the police a sheet of iron, dropped from the visiting machine, on which was stenciled in white letters about an inch in height, "We are coming back to give you English swine a good blowing up tomorrow night." This "bit of 'strafing,'" as an officer called it, was treated entirely as a joke and a bluff, but it was destined to be made good with a vengeance.

Phone messages calling out volunteer firemen, constables, nurses, and other emergency workers, began to be sent out before 10 o'clock on the following night, but the first the general public knew of the coming of the raiders was through the nearing detonations from the direction of the East End. Instantly, from tenements, hotels, and theaters, garbed in everything from bath robes to evening dress, London's millions began pouring into the streets and squares to "see the fun," and to not over one or two in a thousand of all that multitude did the raid sink home as anything more than a tremendously dramatic and highly diverting spectacle.

From where I watched at my window I saw one searchlight after another swing up and fasten on the Zeppelins, much after the way the reatas of a band of cowboys accumulate on an especially refractory steer. But here there was no entangling, no stumbling, no pause. Swiftly the raiders came on, and presently the eastern heavens were alight with the fires that had sprung up in their wake. At first there was no apparent connection between the sudden bursts of flame from the earth and the explosions, but as the machines came nearer I began to observe that the latter fol-

lowed the former at gradually decreasing intervals. Every flash of light heralded its corresponding detonation, and presently I noted that the least lurid of the flashes were always followed by the loudest explosions, due, I soon decided, to the fact that these were the explosive bombs proper—the ones loaded with the powerful "T. N. T." or trinitrotoluol—and that the brighter bursts, with the dull "knocking" booms, were the incendiaries, filled principally with "thermit" or powdered aluminum. This conjecture was quickly verified when, as the bombs began to drop within half a mile, I was able to identify the incendiaries beyond question by the trail from their lighted fuses.

By this time I was able to see that there were two machines, one following the other, but not quite in line. I was especially astonished at the comparatively low altitude at which they seemed to be flying, and, offhand, at that moment, I should probably have estimated this to have been about 2,500 feet. Later reflection has convinced me that this false impression was traceable to the fact that I had never before seen an airship of over half the size of the average Zeppelin, and that, as a consequence—there being nothing to compare with them as a linear unit—the great length of the raiders made them seem much lower than they really were. It is probable that on this occasion they were flying at about 6,000 feet, considerably lower than in the October raid following. It is revealing no military secret to say that at this time—September—London did not have a single high-powered anti-aircraft gun, such of these as had been manufactured up to that time having been rushed to the fleet, the east coast, or to France and Flanders. This state of things was, undoubtedly, known to the Germans, and they took full advantage of it in venturing nearer the earth than they are ever likely, voluntarily, to come again in the course of an English raid.

The raiders appeared to be almost directly overhead as they passed over the vicinity of my hotel, but the fact that the nine or ten bombs dropped at that moment fell from 150 to 300 yards away, is the best proof that this structure was not menaced at any time. They were making frequent quick, jerky jumps as they passed over, and one especially strong upward leap I was able to connect with a flight of two or three "fire trails," which told of as many bombs released in quick succession. The trajectory of these lines of light indicated that the bombs traveled first, while still influenced by the impulse of the moving Zeppelin, at an angle of 30 or 40° from the perpendicular, but gradually "rounded" over until they were dropping almost straight at the instant of their impact with the earth. I distinctly felt the sharp "tug" of the air—drawing toward the bomb, be it noted—following all of the explosions within a distance of 300 yards, this being much more in evidence in the case of the T. N. T. missiles than with the "incendiaries." A few fragments of glass came down in neighboring houses, but a block nearer the explosions I could hear it falling in showers.

The fire of the anti-aircraft guns on this occasion did not begin until the Zeppelins, growing bold as a consequence of their unchallenged progress, slowed and started to signal to each other with winking lights, probably orders or queries concerning possible targets. The two big air bags appeared almost stationary when the first shots were fired, and there is little doubt that guns of any great power could have "felt" their way along to hits within a few seconds. Such shells as were fired, however, were plainly away off on length, and, apparently, rather wild on direction. The gunners available at this time were practically all untrained reservists, rating little, if any, better than the entirely inadequate ordnance they served.

As the firing began, people not immediately under the Zeppelins started hurrying to the streets and squares, the better to watch the effect of the shots, and presently, as the flash of bursting

These Photographs, Just Received from Great Britain, Show Some of the Ruin Worked by Zeppelin Bombs Dropped during the Most Recent Assault There by German Aerial Forces. The Bomb Which Damaged the Residence Above and Killed a Woman and Child, Exploded at the Ground but Spent Its Greatest Force against the Upper Part of the Structure

The Roof and Second Floors of the Dwellings Pictured Above and Below were More Badly Injured than the Lower Sections, as Is Clearly Discernible

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shrapnel crept upward toward their targets, a generous round of hand-clapping and cheering came from a group on a neighboring roof, much, indeed, as they might have applauded if a batter had hit to "boundary" in a cricket game. No sooner, however, did the gunners appear to be locating their marks than a cloud of white vapor began to issue from both Zeppelins, the clack of their propellers again ground forth, and, with a quick play of shadows among their shifting planes, they headed up at a sharp angle and almost seemed to leap out of sight. Half a minute later the report of a single bomb sounded away to the northeast, and the raid was over. This Parthian shot, I may add, striking between a halted motor bus and a saloon near the King's Cross railway station, killed a dozen people and wounded twice that number.

I have seen it stated that the Germans have a dense harmless chemical gas which is used to obscure a Zeppelin under fire, but I am rather inclined to believe that the white mist I observed was steam from the exhausts, and that this was also forced into the outer envelope to heat and increase the lifting power of the hydrogen in the ballonets.

The firing continued for five or six minutes without anything like a hit appearing to have been scored, and then stopped as suddenly as it began. All of the guns of the central London area were in action, and as a consequence a very lively shower of shrapnel shell and casing shortly began to descend upon several square miles of the most congested sections of the city. This steel hail drove to cover many, including myself, who had "stuck it out" during the Zeppelin bombardment, and that a considerable number of those killed received their injuries from anti-aircraft gun projectiles could be gleaned even from the closely censored account of the inquests. Unmistakable bullet marks on buildings and trees were to be seen the following day at many points remote from the "swath" of the bombs, and several fragments of shell casing shown me were capable of inflicting far more serious wounds than was the comparatively thin piece of incendiary bomb which I picked up in a later raid. The latest London police instructions, directing those anywhere near the path of the Zeppelins to take cover until the firing is over, were doubtless prompted by a desire to avoid in the future the very considerable loss of life caused by shells fired at the raiders.

The force with which these spent missiles come to earth after their mile or two of fall may be judged from the words of a bank teller with whom I talked the day after this raid. "I live in a villa at Highgate," he said, "and during the firing an unbroken shrapnel case—probably from the big four-inch gun on Parliament Hill—came through the slate roof, the ceiling of my daughter's third-story bedroom, and went on through the floor into a hallway below. My daughter, who was watching the firing from a window, was uninjured. Half an hour later she was asleep in the very bed that had been littered by plaster from the shell case. In fact, sir, none of my family had very much less than our regular nine hours of rest as a consequence of the house being hit."

This is also an illuminative example of the matter-of-fact spirit in which the raids are accepted by the typical Londoner, and it is this spirit, indeed, which is likely to prove the one most important factor in defeating Germany's prime objective, that of forcing Britain to spend millions of money and employ thousands of men in connection with an elaborate defensive establishment.

The way in which the fires were mastered was one of the most remarkable features of this raid. For three or four miles, across the very heart of London, bombs had been dropped on an average of something more than one to the block. There were intervals of three or four blocks here and there that were untouched, but, on the other hand, several bombs often landed close

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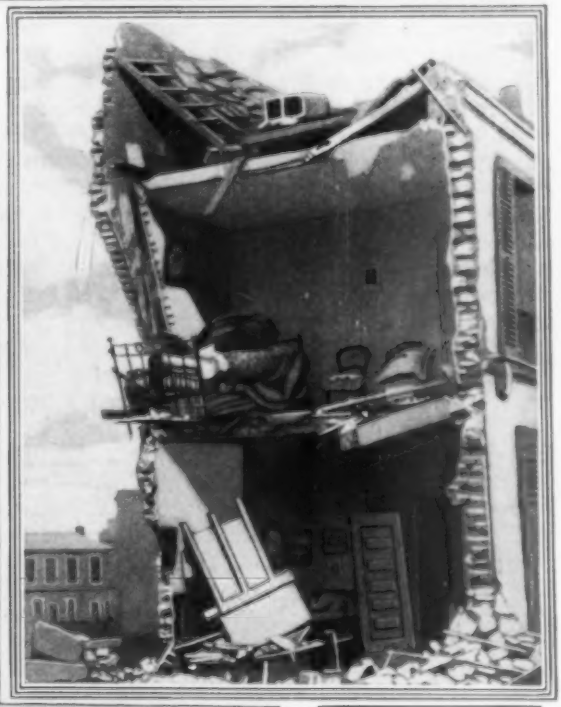
The Paris Subway Is Clearly Visible through the Great Cone-Shaped Hole, Shown in the Foreground, Which was Dug by a Zeppelin Bomb Dropped during the Latest Attack upon the French Metropolis by the German Aerial Forces

This Shows a Five-Story Apartment Building Wrecked by a German Bomb. The Occupants, All of Whom Were Asleep at the Time of the Assault, were Killed in Their Bedchambers



A Bomb Cut This Residence Squarely in Two, Blowing One-Half of It into Small Pieces and Leaving the Remainder Standing. At the Time of the Explosion a Baby Was Asleep in the Bed to be Seen Hanging over the Edge of the Second Floor. The Child Escaped Injury

together in a single block. Probably something over half of these were incendiary bombs, and among these—because they were lighted beforehand—there must have been few failures to explode. Indeed, all of the several unexploded bombs which were shown me after each raid were of the nonincendiary type, containing either T. N. T. or picric acid. These rarely, if ever, started fires, even on exploding. From a short distance, the explosion of the T. N. T. bombs was marked by a sudden brilliant flash, while a warm, flickering, red glow always followed the duller detonation of the incendiary. If the latter struck in a street or square, the glow died down in 20 or 30 seconds; if a building, there were usually flames bursting from the roof inside of a minute or two.

At the moment the last bomb was dropped, the glow of countless fires stretched away to the northeast as far as my eye could see. Ten minutes later—when I came up again after the firing had ceased—there were only four or five. One of these was from a broken gas main in an alley, and another from a celluloid factory in the East End, which burned all night. This most creditable work was due entirely to careful previsionary measures. The London fire department was always an efficient one, and care had been taken not to weaken it by enlistments for the army. A large number of volunteer firemen had also been taken on and trained, and these were summoned by telephone as soon as the Zeppelins were reported from the coast. Five minutes before the report of the first bomb, the sound of fire engines dashing through the streets could be heard, and in this way reserves from the unthreatened parts of London were concentrated on the endangered one. It appears, also, that considerable heed had been taken of the police warning to have sand and water handy on the upper floors of all houses, and a volunteer fireman told me that, in many instances, fires were under control before the department arrived. One man, whom I helped hobble along to a near-by hospital, had put out, unassisted, the fire in his own house, and had later sprained his ankle trying to climb a shattered stairway to help one of his neighbors. Both of these men spoke of the comparative ease with which the fires were extinguished with wet blankets.

Like all high explosives, those used in the bombs dropped on London displayed a characteristic "freakiness." A bomb which struck almost exactly in the center of Queen's Square, shattering the fronts of several hospitals, and breaking every window within two blocks, only made a hole about four feet across and three feet deep in the soft earth of the lawn upon which it dropped. Similarly, in Kingsway in the October raid, a bomb which killed or injured every passenger in a motor bus passing at a distance of a hundred feet, hardly cracked the pavement. Yet a bomb striking the same pavement 200 yards away made a hole almost big enough to drive an omnibus into, at the same time exerting enough force upward to break every pane of glass in India House, London's largest and most imposing office building. The tons and tons of plate-glass fragments falling to the sidewalk at this point literally cut to pieces several men who were passing at the moment of the explosion, their remains having been found half buried in the sharp fragments. I was at the door of a theater on the Strand when this particular explosion occurred, and the sound—half roar, half tinkle—of the plate glass falling from the great office buildings along Kingsway was one of the strangest, weirdest noises I ever heard.

It was in this district that the heaviest loss of life so far inflicted in any of the London raids occurred. The driver of the motor bus I have just spoken of was blown from his seat, across the broad sidewalk, and up against a billboard, leaving a bloody smudge across the smiling features of a popular stage beauty whose poster was affixed there. I was at this point within three minutes of the explosion,

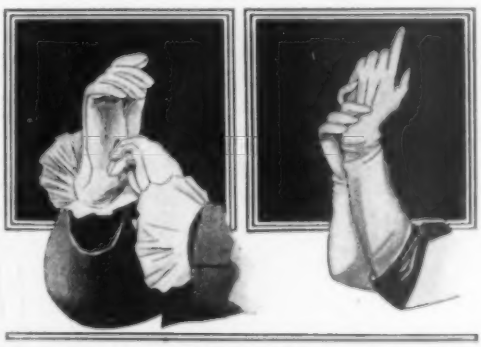
and the dead and injured were being laid in rows along the sidewalk. Several of the trunks were dismembered, and two or three of the bodies were so limp as to suggest that most of the principal bones were shattered. The fact that practically every person on this bus was either killed or badly hurt has led me to believe their injuries resulted from being blown against something by a current of air rather than from fragments of the bomb. The police had thrown up barriers before I could get to the point where the worst damage had been done, in front of a public house or saloon, but even from a distance of 50 yards I was able to see a long row of dead that had been laid out on the sidewalk. In all, I must have seen close to a score of unmistakably dead in this one district, and I am inclined to believe that the popular report that 50 were killed within three blocks is not far wrong; this in spite of the fact that the official bulletins admitted a total of only 56 killed by this raid in all of London.

From my own observations, and from conversations with doctors and volunteer firemen and constables—the "regulars," I might explain, are under strict orders not to talk—I have formed these general conclusions regarding injuries inflicted by Zeppelin bombs: That the very large majority of these were received on the streets rather than in buildings, and that of those hurt in buildings, nearly all were occupying upper rooms; that of those injured on the street, probably not over five or ten per cent were struck by fragments of bombs, and that in the case of those dying from the latter cause, death usually came several days after the injury as a consequence of the almost inevitable blood poisoning.

I believe that many structures were worse smashed up from bombs which struck close beside them, as on the sidewalk or in an alley, than from bombs on the roofs. In the latter instances the force of the explosion is usually exhausted upward. Even the flimsiest tenements were rarely much shattered below the two upper stories from a bomb on their roofs, and a fairly modern office building in the "City," not far from the American consulate, was damaged only in a single top-floor suite. The worst damage occurred where a bomb went through a roof and into a court or light well without exploding until it was down near the foundations. I saw a three-story brick building that was completely razed from such an explosion, while another—a modern four-story steel-and-stone structure—was so shattered that it will have to be completely rebuilt.

NEW ARTISTIC DESIGNS IN WOMEN'S GLOVES

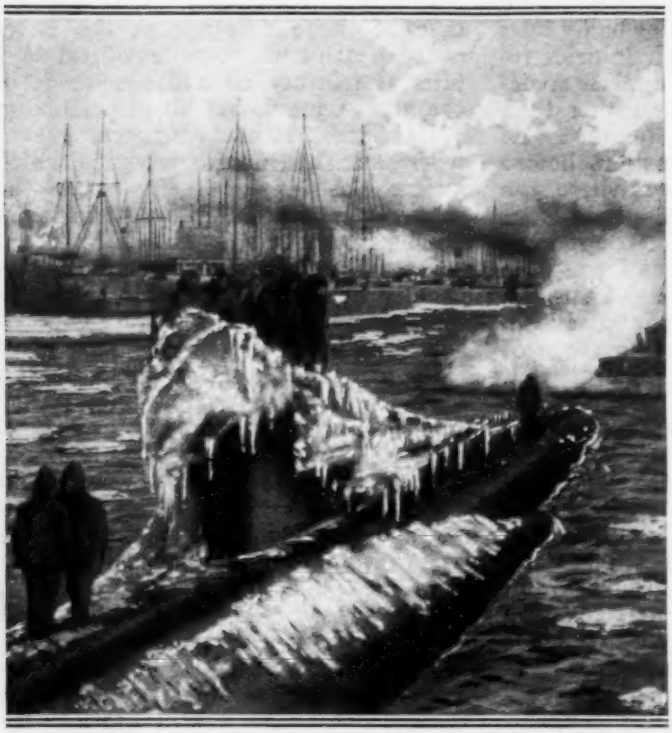
Among the novel features of the newest styles of wearing apparel are ladies' gloves of designs that are not only unusual but also artistic. One of the styles which possesses utilitarian merit is a glove made with a wide, loose frill of ribbon which hangs about the wrist and hand just as a frill on a sleeve. The fact that it can be easily removed makes it especially convenient. In some cases gauntlet gloves are made of pure white chamois and lined with taffeta. Another variation is long mousquetaire gloves that can be drawn well up on the arm and turned back to show a lining of shiny black kid.



Two New Styles of Women's Gloves: At the Left Is a Pair with Frills of White Ribbon Attached. Right: Gloves Which Draw Well Up on the Arm and Turn Back, Showing a Lining of Shiny Black Kid

BRITISH SUBMARINE GLAZED WITH ICE AFTER RAID

Upon returning to its base some time ago, after stealing through the waters of the Baltic and sinking a German destroyer, the British submarine "E-9" bore a striking resemblance to an elongated iceberg. Its rounded sides, conning tower, periscope tubes, and cables were heavily incrusted with ice which had formed during the long, perilous voyage the craft had made. As it rode into the harbor, some of its crew, swathed in clothes that made them look like Eskimos, stood on the slippery deck while others grouped themselves on the white-glazed conning tower, eagerly awaiting the chance to get ashore. The incident serves to indicate some of the hardships and perils braved by submarine crews during winter operations, when the difficulties of navigation are materially increased by ice and cold.



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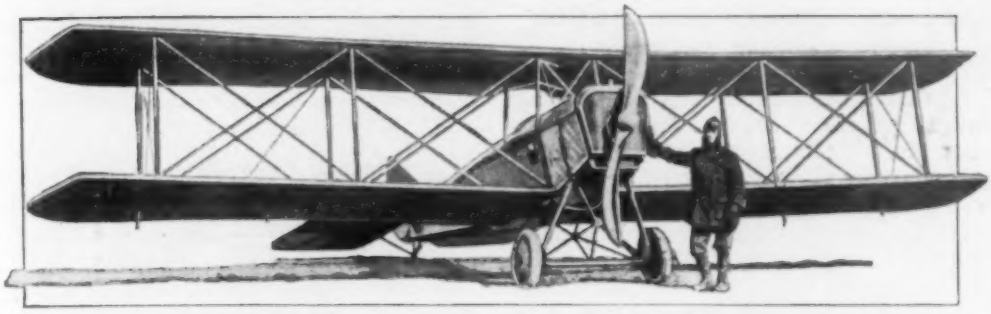
British Submarine Returning to Its Base after Sinking a German Destroyer in the Baltic Sea

NATION'S AMATEUR RADIO MEN SHOW PREPAREDNESS

That the licensed amateur wireless operators of this country, of whom there are 25,000, would be able instantly and efficiently to meet any national emergency which might demand their services, was demonstrated in a spectacular way on the night of February 21, when a message was sent out from a wireless station in Rock Island, Ill., and immediately thereafter was relayed to every part of the country until it reached the east and west coasts, the Gulf of Mexico, and even British Columbia. The range of the Rock Island station enabled it to reach all operators within 300 miles; these men in turn flashed it on until it had reached the whole of the army of amateurs scattered over the country. The greetings, which were appropriate to Washington's birthday, were delivered to the governor of each state, to the mayors of the principal cities, and to others, the Boy Scouts assisting in some instances. There were 23 words in the message, which read: "A democracy requires that a people who govern themselves and educate themselves should be so armed and disciplined that they can protect themselves."

GOOD SPEED SHOWING MADE BY DOMESTIC AEROPLANE

Ninety-five miles an hour is claimed as the average speed of a late type of the Thomas tractor biplane which is built for military purposes. The craft has the appearance of sturdiness and



American-Built Biplane of Military Type with Average Speed of 95 Miles an Hour

is equipped with a domestic motor developing 135 hp. Both of its planes are of the same length and the body streamline. Over a measured course at Ithaca, N. Y., the craft recently flew a half mile in 17⅘ seconds, and made the same distance against a wind in 20⅕ seconds. On another short flight, during which the wind favored the machine, a speed of 102½ miles an hour was attained.

ELECTRIC INSTRUMENT DETECTS FIRE DAMP

A gas detector for the purpose of determining accurately the presence of fire damp or other inflammable gases in mines has been invented. With it the fact that electric lamps furnish no warning of the presence of gases no longer constitutes an objection to their use. The instrument may also supplement the common safety lamps. It is portable, weighs about 13 lb., and is operated by batteries. By the automatic movement of an index hand over a graduated scale it gives a direct quantitative measurement of the percentage of fire damp in the air tested. It is said that a reading can be made by it in less than 15 seconds, regardless of dust, draft, or pressure. The device is made in two styles; one has a graduated scale to show from 0 to 3 per cent inflammable gas and is intended for use in collieries where safety lamps are employed. The other is for collieries where open lamps are permitted and is designed for accuracy between the limits of 0 and 1 per cent.

SABER UMBRELLA LATEST MILITARY NOVELTY

A taste for articles of military design which has found expression in such widely differing lines as toys and women's hats, has recently manifested itself in the production of an umbrella for women designed to be carried as a saber. This article is equipped with loops or straps by which it may be hung from the wrist or belt, and its simple decoration is meant to suggest a sword. It can be very appropriately worn with a costume which has features in common with a soldier's uniform.

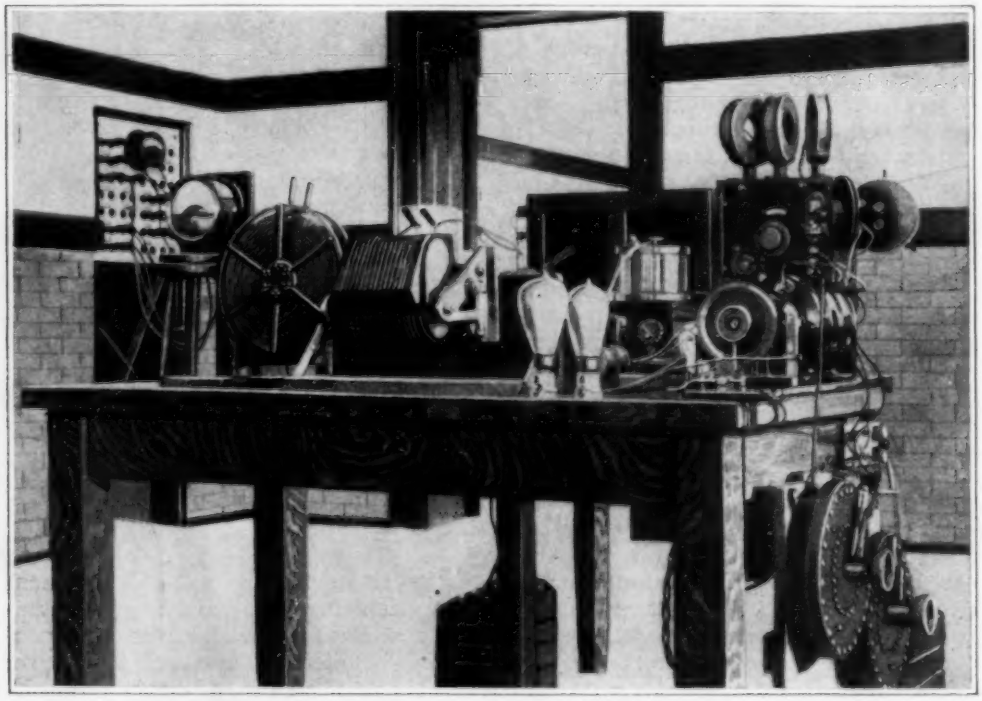
¶ Experts employed by the Department of Agriculture who have been developing new uses for cranberries have produced candied cranberries which resemble candied cherries and are suitable for many purposes.

DIRECTION-FINDING RADIO INSTRUMENT INVENTED

As a result of experiments extending over a period of several years, wireless experts connected with the Bureau of Standards at Washington have developed a remarkable instrument for indicating the source of radio impulses. At the instant signals are received the apparatus registers the direction from which they emanate. Although it is very sensitive, it is less disturbed by unfavorable atmospheric conditions than is an ordinary receiving apparatus. The "finder," as it may be termed, can be used indoors without being grounded or connected with an aerial. Its value for military and naval purposes is obvious. It can be used at sea, as well as on land, to detect the direction of a ship equipped with wireless instruments. It is light enough to be carried in a motor car or other vehicle. The government is also furnished by it a means of determining the locations of radio stations operating in violation of regulations. It has worked satisfactorily when messages have been received from San Diego, Panama, Key West, Boston, Germany, and other distant points.

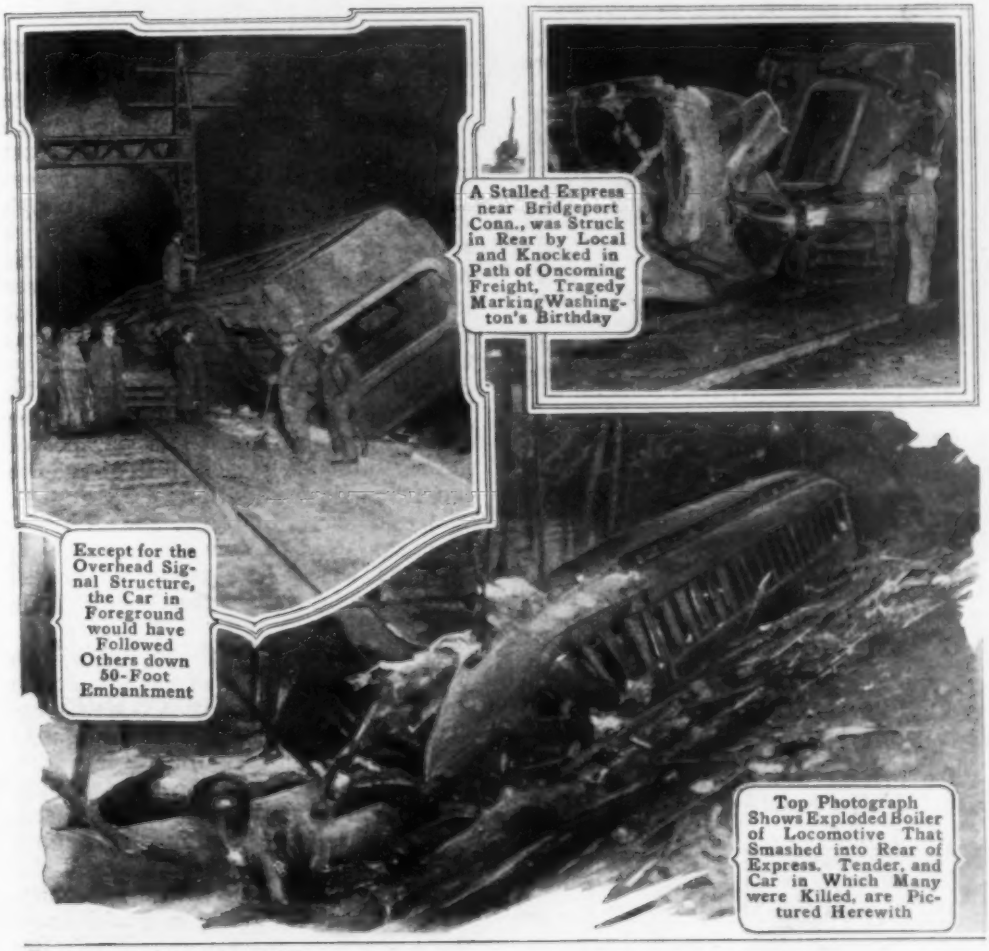
INSTRUMENT DETECTS LEAKS IN WATER PIPES

A device for detecting leaks in water mains or smaller pipes is being manufactured, which in appearance and size exactly resembles a standard telephone receiver. The instrument is composed entirely of hard rubber and aluminum. Its operation is simple. A metal rod is driven into the ground near a water pipe, or a key is placed in position on a street-surface valve, as the case may be. The point of the instrument is placed on the rod or key. If there is a leak near by, the sound of escaping water can be heard through the receiver. The invention is of particular value in places where there may be wastage of metered water.



This Apparatus Indicates the Direction from Which Wireless Signals are Emanating

THREE TRAINS CRASH TOGETHER ON NEW HAVEN



A Stalled Express near Bridgeport Conn., was Struck in Rear by Local and Knocked in Path of Oncoming Freight, Tragedy Marking Washington's Birthday

Except for the Overhead Signal Structure, the Car in Foreground would have Followed Others down 50-Foot Embankment

Top Photograph Shows Exploded Boiler of Locomotive That Smashed into Rear of Express, Tender, and Car in Which Many were Killed, are Pictured Herewith

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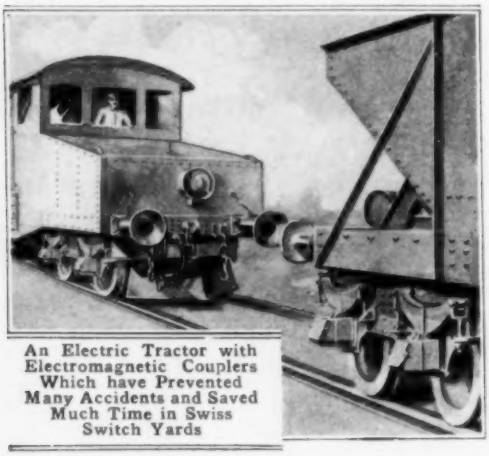
ELECTROMAGNET COUPLERS EXPEDITE SWITCHING

Electromagnet couplers have been devised as a feature of switching locomotives used in Berne, Switzerland, thereby dispensing with coupling cars by hand, a practice which costs many lives annually. The Swiss state railway has built a number of storage-battery tractors equipped with these couplers, the batteries furnishing power both for switching and for energizing the magnets. One magnet is located near each of the four corners of the locomotive, like a buffer. The four consist of cylinders with flaring outer ends. Around these iron cores are wound coils of insulated wire. When a current is sent through these circuits the cores become powerfully magnetized. The couplers are directly in line with the car buffers which engage them, after the manner of a ball and socket. This contact permits considerable flexibility. To effect a coupling, after a tractor has drawn up to a car it is only necessary for the motorman in the cab to feed current through the proper coils. By throwing the switch

out the car is uncoupled. Each magnet when in perfect contact is good for a drawbar pull of 3,740 lb. Even when there is a slight gap a magnet exerts a pull of nearly 2,000 lb., so that an ordinary jar will not break the hold of the tractor. Not only has this improvement prevented many accidents, but it has effected a great saving of time.



An Electric Tractor with Electromagnetic Couplers Which have Prevented Many Accidents and Saved Much Time in Swiss Switch Yards

ARTISTIC REFUSE HOLDERS FOR NEW YORK PARK

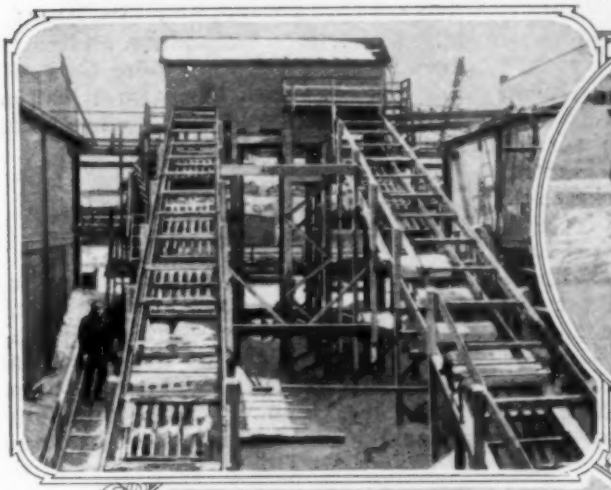
An artistic refuse container of unusual design has been adopted for the New York Zoölogical Park. In appearance it closely resembles a symmetrical tree stump. It stands 26 in. high and is 18 in. in diameter. The exterior is made of special rust-resisting steel, the rough surface being formed by means of dies patterned from real bark. A removable corrugated-iron can fits into this casing; it is 24 in. high, 17 in. in diameter, and has a double-riveted bottom.

GREAT IRRIGATION PROJECT IN INDIA COMPLETED

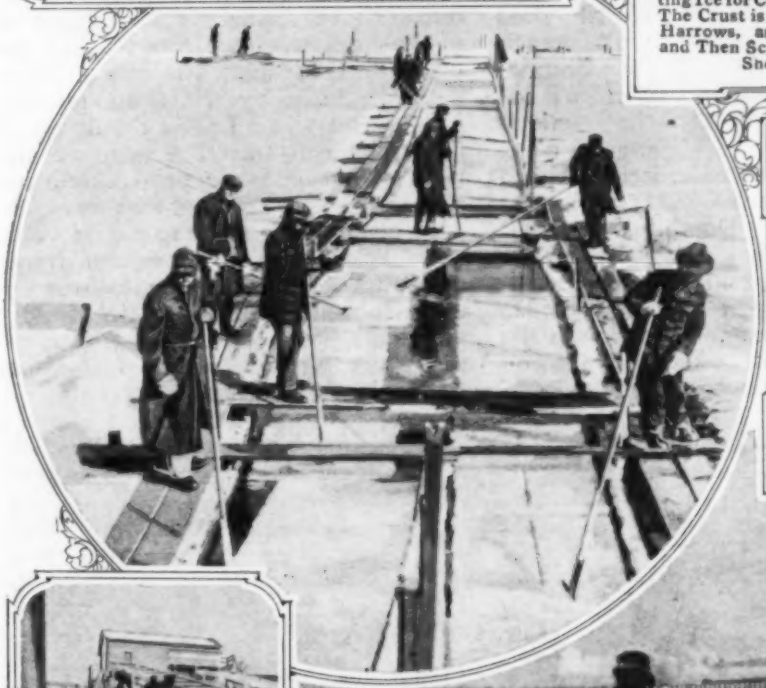
What is pronounced the greatest irrigation project so far undertaken in India was recently completed when the upper Jhelum Canal in the Punjab was opened. The canal itself cost nearly $15,000,000. Because it extends from the border of a rough mountainous region down to the plains it has been one of the most difficult pieces of engineering of its kind ever undertaken in India. The location of the head works was under investigation for four years. The site finally chosen was near Mangla Fort on the Jhelum River, near the border of the mountainous region. The parapet of the retaining wall rises 70 ft. above the canal and its foundations extend 25 ft. below the canal bed to insure stability. The regulation of flow is accomplished by three tiers of floodgates. The canal after crossing a plain terminates at the Chenab River.

For the first mile the canal is in a cutting, about 110 feet deep, through soft limestone and clay. On this excavation the staff and labor gangs worked continuously for three years, in two shifts, day and night. Many labor-saving appliances were used. For 50 miles the canal runs through a tract furrowed by deep and well defined hill torrents, which flow in shifting sand beds having a rapid drop. For some distance beyond this it lies in a flood-swept tract where cross-drainage works are numerous and the construction problems very difficult. The work on the project was in progress for 10 years and there were many discouragements. In 1914 the river rose to an unusual height and burst through the soft-rock wall, dividing the canal from the stream and submerging the regulator, which was then at a low level of construction. The resulting havoc entailed a great amount of additional labor, but, as in other instances, the engineers finally triumphed. With the completion of the project a rich region is made available for farming.

CUTTING ICE FROM SNOW-INCRUSTED FIELD



These Pictures Illustrate the Method Employed in Breaking and Removing Snow before Cutting Ice for Commercial Purposes. The Crust is Loosened with Disk Harrows, as Indicated Below, and Then Scraped in the Manner Shown Above



Left: Pushing Large Cakes of Ice through a Runway to Endless-Belt Conveyors Which Lift Them into Storage Houses, as Shown at the Top. As the Cakes Pass up These Inclines, the Remaining Snow is Scraped from Them with Knives Regulated by Men Stationed near the Lower Ends of the Chutes. This Is Necessary in Order to Keep Ice in Good Condition

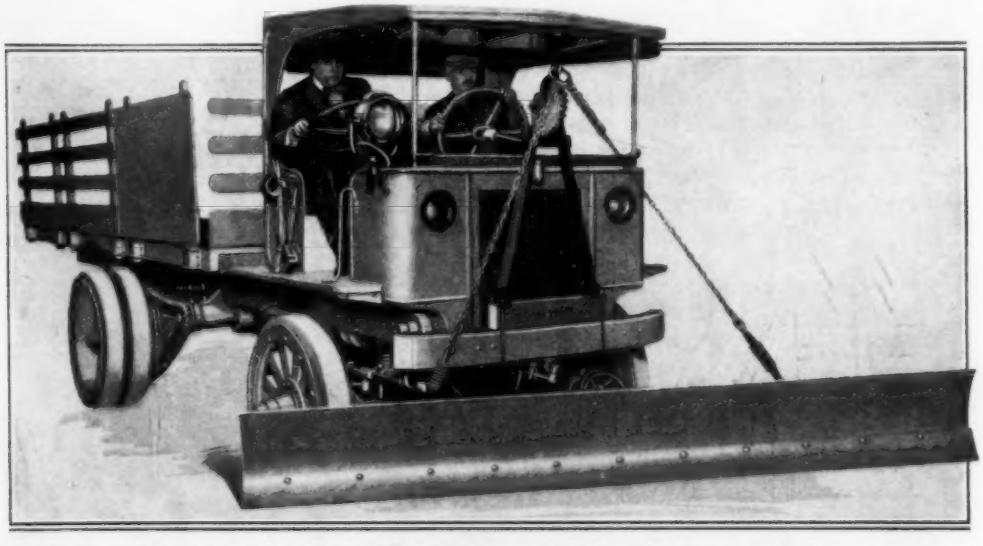
The Photographs were Taken on a Small Lake at Omaha, Where Thousands of Tons of Ice are Cut for Local and State Consumption

ALASKA MAIL UNDELIVERED FOR EIGHT MONTHS

For slow mail delivery in United States territory it would seem that the mail service for central Alaska sets the record. It often happens that matter started in October on its way to these ice-bound regions of the North does not reach its destination until the following June. Settlers assert that similarly isolated regions in northern Canada are better served by the Dominion's postal authorities. One Alaskan settler located at Tofty, which is about halfway between Nome and Dawson as the crow flies, near the junction of the Tanana and the Yukon rivers, on going to the post office after the long-delayed mail arrived, found an accumulation of letters, magazines, and packages for him weighing more than 100 lb. Filling a mail bag with a load of 92 lb., he delivered that to his home and returned for the remainder.

SNOWPLOW ATTACHMENT FOR MOTOR TRUCKS

Snowplow attachments of a new design that are to be used on the motor trucks of the street-cleaning department for the work of snow removal have been recently adopted by New York City. The apparatus consists of a steel pusher, or blade, 10 ft. long and 14 in. wide. This is hung by a semicircular steel frame immediately ahead of the front wheels of the truck. The mechanism includes a means of angular adjustment by which an operator sitting at a wheel beside the driver of the truck can turn the snow to the right or left side. An automatic blade release is so constructed that when the edge of the blade strikes an immovable obstruction, such as a manhole frame or car track, the blade passes over the obstacle and returns to its former position. Trucks equipped with these plows can work rapidly. The cost of the device is not great.



Motor Truck Equipped with One of New York's New Snowplow Attachments

WIND AND FLOOD SWEEP SOUTHERN CALIFORNIA

One of the Railway Depots and Yards in a Low Section of San Diego during the Recent Deluge, Which was Caused by Melting Snows and Incessant Rains

Venice, One of the Resort Places of Southern California, was Badly Inundated. This Picture Shows One of the Marooned Hotels

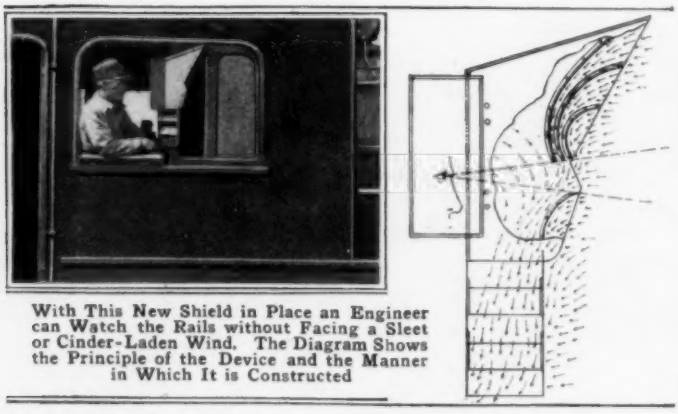
Some 1,100 Rigs were Wrecked by Cyclones in Two California Oil Districts. In the Small Area Shown Here, Three Derricks Are Down

Reinforced-Concrete Motor Bridge over San Diego River was Undermined and the Piers Cut Out beneath It

Remains of Lower Otay Dam, Which Was 565 Feet Long and Had a Spillway Capacity of One and One-Fourth Billion Gallons a Day

EFFECTIVE LOOKOUT SHIELD FOR ENGINE DRIVERS

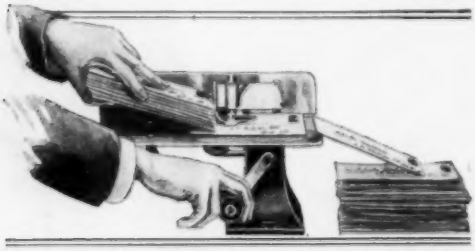
To protect the eyes of a locomotive engineer when he is watching the track ahead, especially during stormy weather, a lookout shield of apparently considerable merit has been developed. The device is a double deflector, and when attached to an engine cab enables the pilot to make observations without facing strong air currents laden with cinders. Furthermore the line of vision is not intercepted by a pane of glass which might become covered with ice or blurred by water. The air upon striking the upper part of the mask at the front is caught by curved plates and directed in an S-shaped course so that it shoots in front of a peephole provided in the mask, and diverts the inrushing air at that open port. It is discharged through ducts in the outer side of the shield with sufficient force to counteract the up draft which is often encountered when a locomotive is running with a cross wind striking it on the fireman's side. It is obvious that the air, in rushing through the deflector, produces a suction force. This draws air in from the rear of the shield so that instead of wind cutting back through the unobstructed peephole, a current is drawn forward through this aperture. The force of this counterdraft is strong enough to lift a piece of cotton waste from one's hands and carry it into the deflector and out at the side. In other words, the line of vision is protected by a strong, down-shooting air blast instead of a pane of glass. The force of this draft is strong enough to carry cinders, dust, insects, rain, sleet, and snow with it and prevent them from being thrown into the engineer's eyes.



With This New Shield in Place an Engineer can Watch the Rails without Facing a Sleet or Cinder-Laden Wind. The Diagram Shows the Principle of the Device and the Manner in Which It is Constructed

HAND-OPERATED LETTER OPENER SAVES TIME

A letter opener, operated by hand, which opens from 85 to 150 letters per minute, is proving to be a profitable timesaver for many business houses whose mail is not large enough to warrant the use of a power-operated opener. Continuous circular blades, revolved by a crank, cut a thread .01 in. wide from the edge of the envelopes, thus eliminating the danger of cutting inclosures. The letters are placed in a pile against a guide and in front of the knives; the turning of the crank feeds them, one by one, between the blades, regardless of width, thickness, or crumpled condition. All envelopes pass through the machine flat, so that no inclosures fall out. No special skill or instruction is required to operate the device. The blades are protected so that there is little danger of injury for the operator.



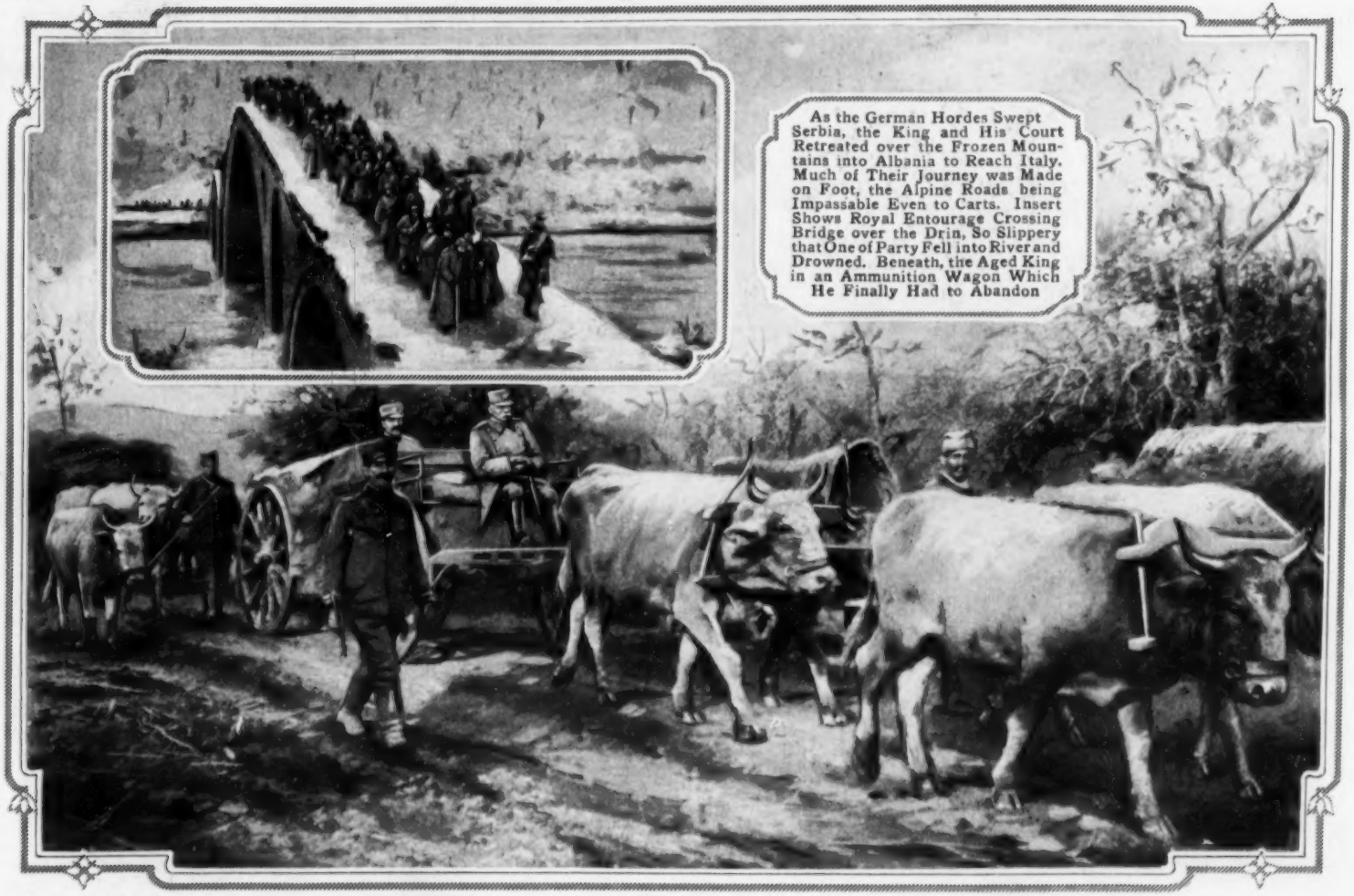
With This Hand-Operated Machine 85 to 150 Letters can be Opened per Minute

GREAT TEUTONIC HOST PENETRATING SERBIA

In Many Places the Germans Found Serbia's Roads Impassable to Motor Cars. Here a Yoke of Oxen is Helping a Machine Out of a Mudhole, While Dozens of Cars at the Rear Wait for Similar Assistance

The Enemy Making a Noonday Halt in a Valley Outside of Belgrade: The Horses and Pack Mules are being Turned Out to Graze While the Men Arrange Their Trappings and Gather about the Field Kitchen

KING PETER AND HIS COURT FLEEING SERBIA



As the German Hordes Swept Serbia, the King and His Court Retreated over the Frozen Mountains into Albania to Reach Italy. Much of Their Journey was Made on Foot, the Alpine Roads being Impassable Even to Carts. Insert Shows Royal Entourage Crossing Bridge over the Drin, So Slippery that One of Party Fell into River and Drowned. Beneath, the Aged King in an Ammunition Wagon Which He Finally Had to Abandon

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WAR-RAZED SERBIA LAND OF WANT AND DEATH

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Serbs Carrying Wounded, during Retreat, over Wrecked Bridge across Morava

Burying Serbian Dead That Littered Battle Field after a Sweeping Attack by the Vastly Superior Forces of the Enemy

Austrian Soldiers Holding Mob of Hungry Civilians Back with Bayonets While Transport Carrying Food for Invading Army Makes Its Way under Guard through Serbian Town. In Many Places the People Are Almost Entirely without Food and Actually Verging upon Starvation

CHILDREN REFUGEES FROM STRICKEN SERBIA

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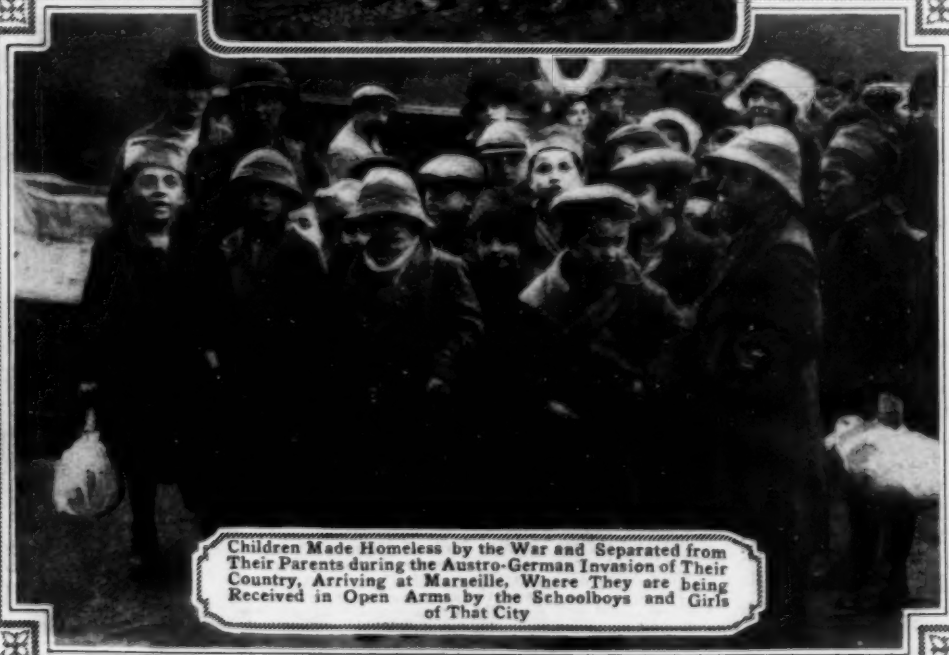
Above: Group of Destitute Serbian Boys and Girls being Cared For at a Refugee Camp Established at Saloniki, Dressed in Clothing Supplied by a Benevolent New Yorker

At the Side Is a Picture of the Youngest Known War Prisoner, a Six-Year-Old Serbian Found with the Troops Captured by Germans. His Homelessness Made His Internment Necessary



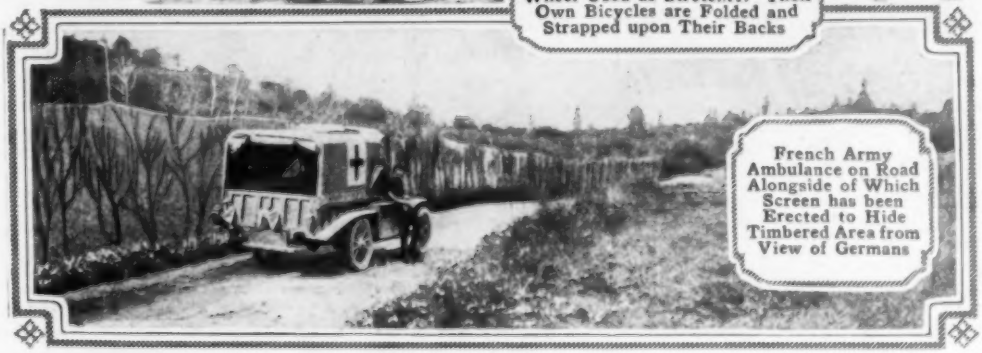
Children Made Homeless by the War and Separated from Their Parents during the Austro-German Invasion of Their Country, Arriving at Marseille, Where They are being Received in Open Arms by the Schoolboys and Girls of That City

CONVEYANCES USED IN TRANSPORTING WOUNDED

Ninety Motor-Car Ambulances, Presented to France by Great Britain, on Display in the Esplanade before the Hotel des Invalides at Paris

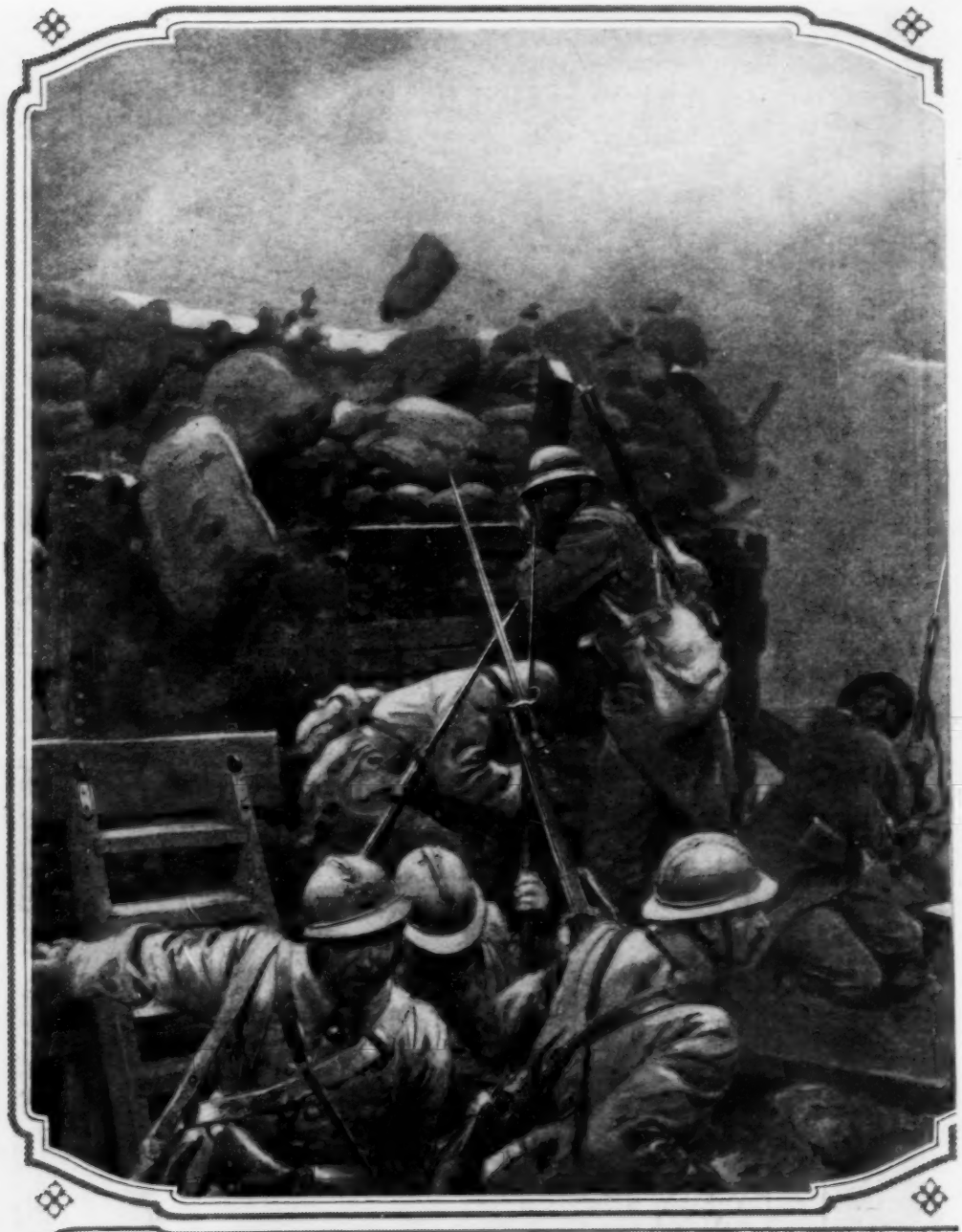
Small Car, Carrying Four Stretchers, Operating from French Trenches to Near-By Hospital

Members of Cycle Corps Carrying Wounded Comrade on Wheel Used as Stretcher. Their Own Bicycles are Folded and Strapped upon Their Backs



French Army Ambulance on Road Alongside of Which Screen has been Erected to Hide Timbered Area from View of Germans

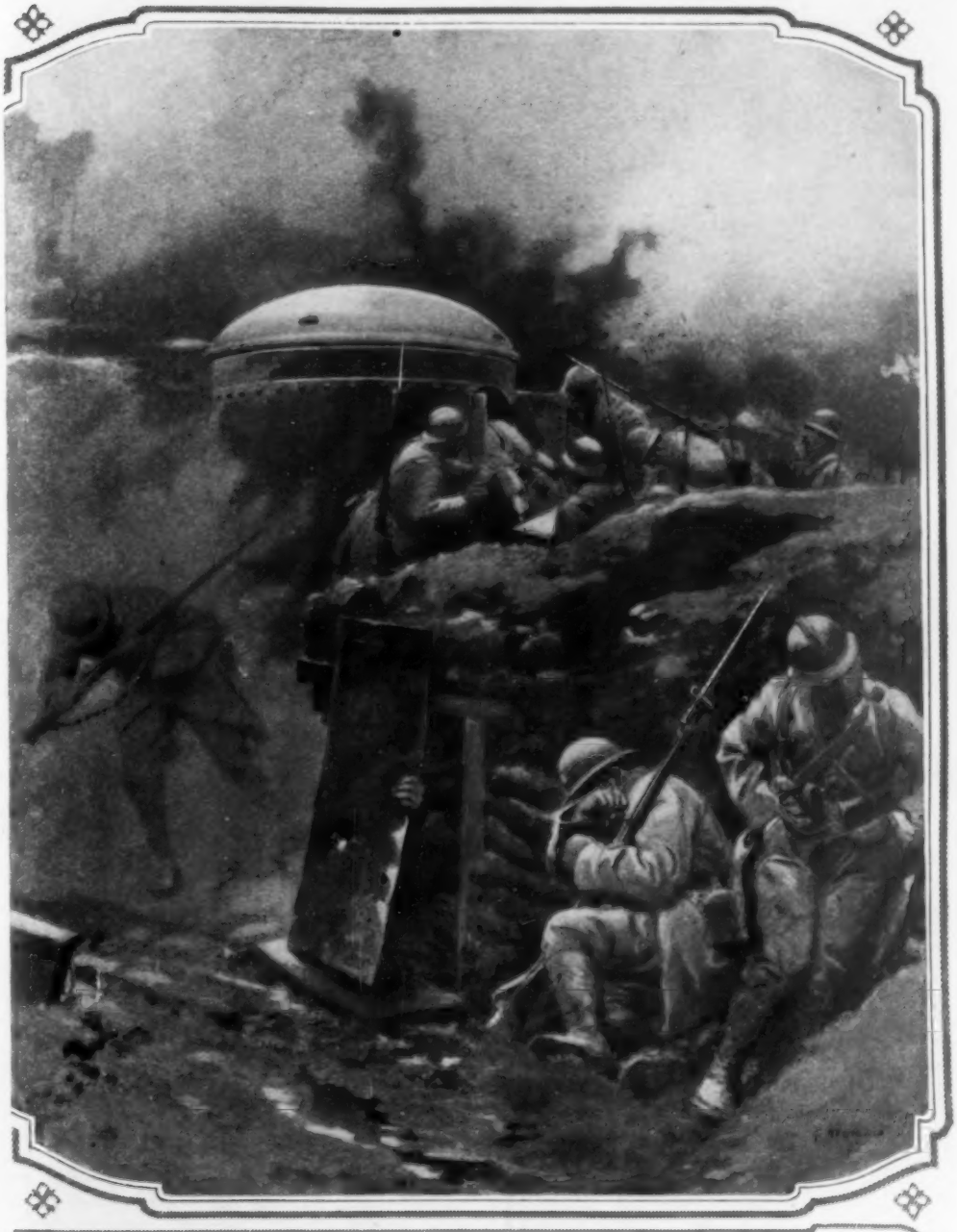
USE OF HEAVY ARTILLERY AGAINST TRENCHES



DRAWN BY F. MATANIA FOR THE SPHERE LONDON, AND COPYRIGHTED

THE tremendous part played in modern warfare by artillery is influencing trench building as well as in the past is now needed for the infantrymen, because of the growing use of heavy artillery batteries tected largely by timbers and sandbags, which has been able to hold out consistently against the lighter and by these is meant steel-reinforced redoubts, with sides as well as overhead works protected and has been most intense, steel shields of different types, boiler plate, and other armor, are said to be in use revolving turrets on the firing line, a distinct innovation and one which has apparently proved its worth. trench during the thick of battle. The cupola in use at one side was captured from a German position

BRINGING ARMORED REDOUBTS INTO EXISTENCE



IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

practically everything else connected with the business of fighting. Greater protection than was required against field positions. Large howitzers and mortars are able to break through an earthen trench, profire from ordinary field pieces. A marked tendency is developing in favor of armored trenches, therefore, strengthened by heavy plates. In some of the French trenches along the western front, where the fighting at the present time. Likewise, as previously reported, the Germans in this same theater have been employing The artist's sketch above, which was drawn from photographic material, shows a partly armored French and is here being employed by French machine-gun operators.

GRIM SIDE OF WAR SEEN IN WESTERN THEATER

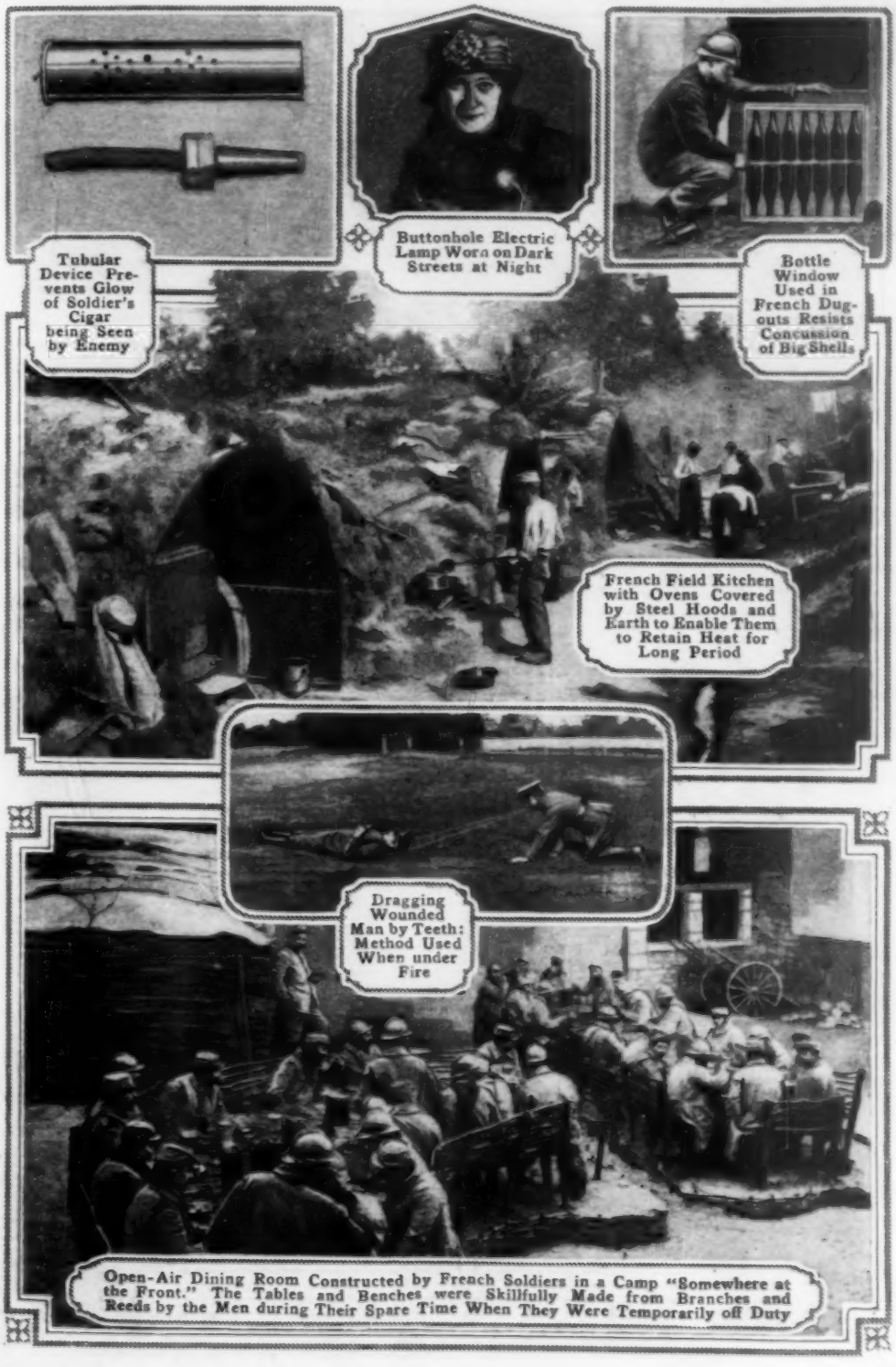
French Colonials Giving First Aid to a Wounded German Found on a Field After an Attack had been Repulsed

Removing Harness from Horses Wounded during a Bombardment of Soissons. Picture Taken during Battle

Horses and Soldiers Littering Battle Field "Somewhere on the Western Front" after Spirited Engagement between French and German Forces

Wounded German Soldiers, under Care in a Small French Church at the Front Which has been Turned into a Military Hospital, at Prayer

ODD SIDELIGHTS ON WAR SNAPPED BY CAMERA


Tubular Device Prevents Glow of Soldier's Cigar being Seen by Enemy
Buttonhole Electric Lamp Worn on Dark Streets at Night
Bottle Window Used in French Dugouts Resists Concussion of Big Shells
French Field Kitchen with Ovens Covered by Steel Hoods and Earth to Enable Them to Retain Heat for Long Period
Dragging Wounded Man by Teeth: Method Used When under Fire

Open-Air Dining Room Constructed by French Soldiers in a Camp "Somewhere at the Front." The Tables and Benches were Skillfully Made from Branches and Reeds by the Men during Their Spare Time When They Were Temporarily off Duty

Austrian Artillery Drawing a Heavy Mountain Battery into Position in the Tyrolean Alps near the Frontier, Where Fighting has Been Intense for Months

Device Indicates Direction of Wind to Austrian Airmen

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Network of Entanglements Protecting Austrian Position in Swamp, Where It Was Necessary to Build the Trenches on Top of the Ground

One Type of Mountain Battery Used by Austrians in Combating Italian Advance on the Frontier. When the Revolving Turret is Covered with Sod, as Shown Here, It Is Almost Impossible for the Enemy to Locate and Destroy the Gun

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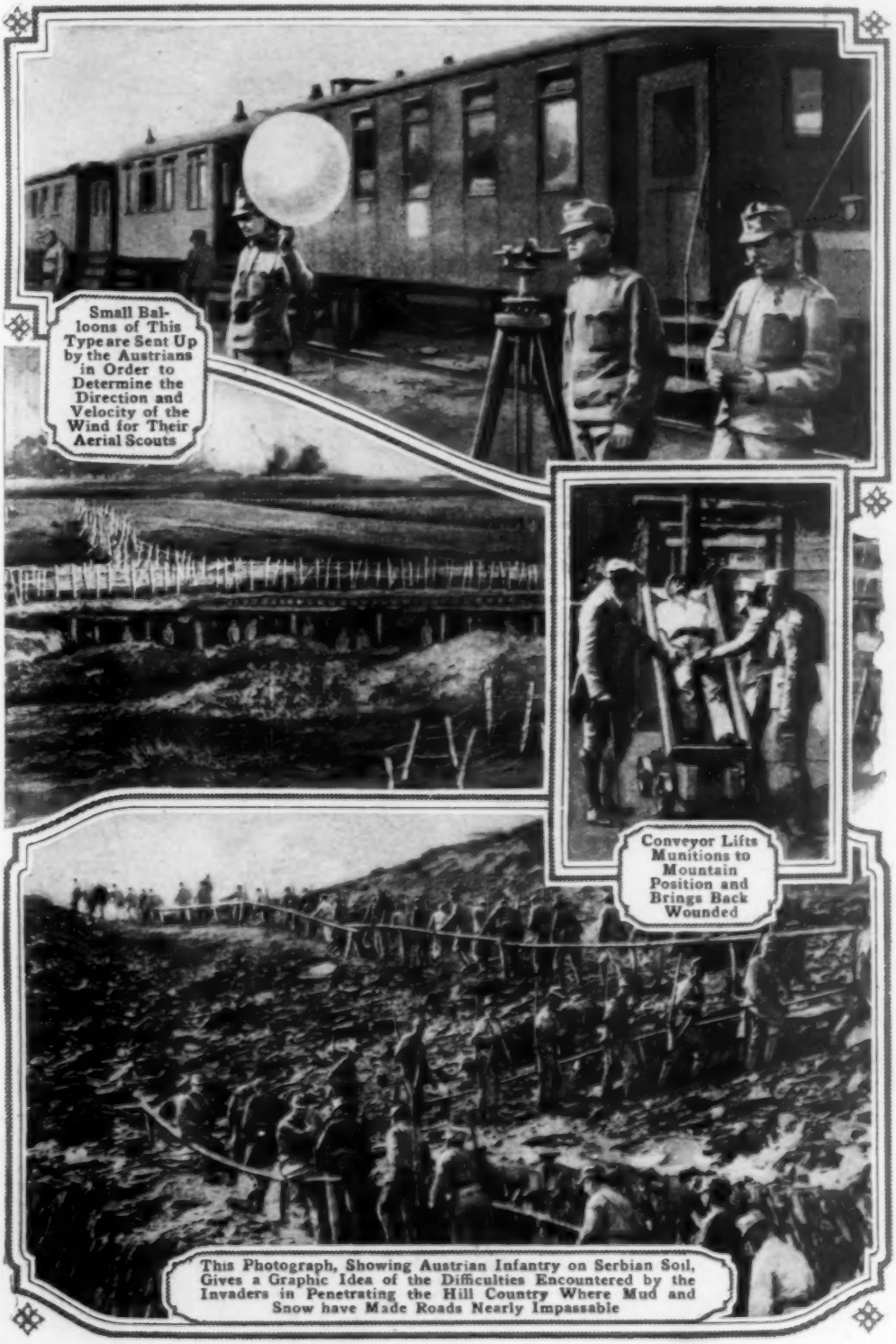
OF AUSTRIAN FORCES ON VARIOUS FRONTS



Small Balloons of This Type are Sent Up by the Austrians in Order to Determine the Direction and Velocity of the Wind for Their Aerial Scouts

Conveyor Lifts Munitions to Mountain Position and Brings Back Wounded

This Photograph, Showing Austrian Infantry on Serbian Soil, Gives a Graphic Idea of the Difficulties Encountered by the Invaders in Penetrating the Hill Country Where Mud and Snow have Made Roads Nearly Impassable

SANITARY PRECAUTIONS OBSERVED BY GERMANS

Temporary Army Hospital of Germans in Serbia: The Wounded are Cared For in the Surrounding Houses, and Food is Prepared in the Open-Air Kitchen, the Yard about Which is Kept as Clean as a Parlor Floor

Soldaten!
Achtet euch in acht! Im Ort ist Cholera!
Esst kein rohes Obst, trinkt kein ungekochtes
Wasser, betretet keine gesperrten Häuser.

The Sign Stretched above This Street in Slonim, Russia, Warns German Soldiers That the Place is Infested with Cholera. The Men are Commanded Not to Eat Raw Fruit, Drink Unboiled Water, nor Enter Any Uninspected House in the City

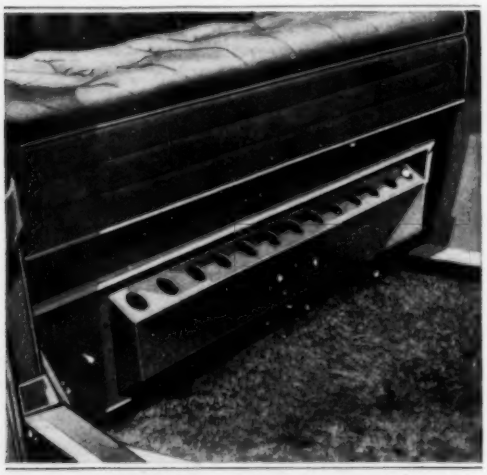
WINTER VIEWS AT FRONT WITHIN GERMAN LINES

Group of Sentries in Eastern Theater Swathed in Full-Length Sheepskin Coats Which Protect Them from Severe Winter Blasts and Snipers as Well, Since in Addition to being Warm They Are Almost Indistinguishable against the White Background of Snow-Covered Fields

Mess Time Becomes an Incident Rather Than an Event When the Fighting Is Intense. Here German Soldiers on the Eastern Front are Gathered about a Field Kitchen during a Snowstorm, Hurriedly Taking Their Noonday Meal

CONVENIENT HEATER MADE FOR SMALL CAR

For warming the interior of one of the popular light motor cars, an inexpensive radiator of the type utilizing

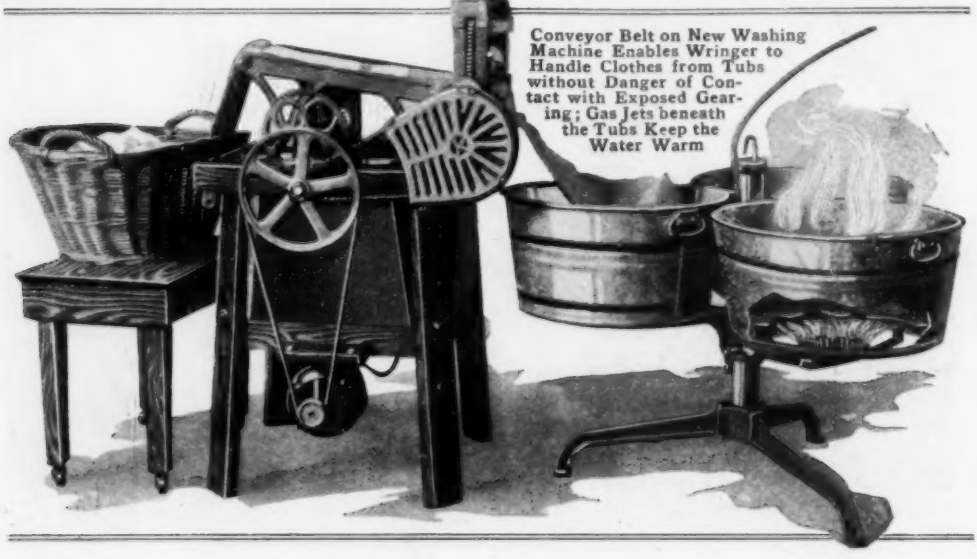


The Heater Makes Use of the Hot Gases Given Off by the Motor and may be Regulated without Leaving the Car

the heated waste gases from an engine has been introduced. It is incased in a neat, enameled housing which fits beneath the front edge of a seat. Its tubing is connected with the exhaust pipe between the motor and muffler, while it is regulated by means of a damper which causes the gases to be diverted. Warm air is circulated under the rugs and about the feet, and may be turned on or off without leaving the machine. The device weighs about four pounds and may be removed easily and stored during the summer months. It is odorless and clean and costs nothing to operate.

CONVEYOR BELT EXTENDS USEFULNESS OF WRINGER

Several innovations of interesting nature are embodied in a washing machine and auxiliary apparatus recently evolved by an Iowa inventor. Of particular note is a conveyor belt attached to one side of the wringer and adapted to carry clothes safely over the working parts of the machine proper. By means of suitable gearing, this conveyor belt is operated by the same electric motor which drives the other parts of the machine. Galvanized tubs supported on an iron tripod at one side carry the hot waters in which clothes are sterilized. An unusual convenience is afforded in a set of gas burners underneath the tubs, which keep the liquids at any desired temperature. Because of the convenience and safety afforded by the conveyor belt, the wringer need not be transferred to the tubs for drying clothes therefrom.



Conveyor Belt on New Washing Machine Enables Wringer to Handle Clothes from Tubs without Danger of Contact with Exposed Gearing; Gas Jets beneath the Tubs Keep the Water Warm

HOW WASHINGTON SIGNALS TIME TO CANAL ZONE

Telegraph lines, a sending and a receiving radio station, and a telegraph operator are among the means used in transmitting daily the correct time from Washington, D. C., to the Panama Canal for the purpose of correcting the chronometers in the port captains' offices and on incoming ships. Absolutely correct time cannot be ascertained by this means, there being a variation of about one-tenth of a second. Correct time is highly important for a vessel, because in making observations of heavenly bodies, a variation of one second means an error of about one-fourth of a nautical mile in location. The time signal is sent by wire from Washington to Key West, whence a relay transmits it by wireless. The Darien wireless station in the Canal Zone in turn transmits the signal by ordinary telegraph to the port captains' offices.

The signal is sent from Key West in a series of dots. Five minutes before noon the wireless begins counting off the seconds by dots. After the twenty-eighth second there is a pause, the twenty-ninth dot being omitted; similarly there is a pause from the fifty-fourth to the sixtieth second. The count is resumed exactly on the minute. This procedure is kept up until 10 seconds before 12 o'clock, when there is a pause followed by a long dash at exactly 12 o'clock. The aerial transmission is recorded at Darien by a current too slight to permit ordinary electrical relaying. Consequently an operator with a wireless receiver at his ears sends dots through an ordinary telegraph wire to the port captains. With practice he can strike the dots on his sending key in almost perfect synchronism with the dots received. The principal difficulty is in sending the final dash after a wait of 10 seconds. Here the human brain fails to react instantaneously, the tests showing that the lag is between two-tenths and three-tenths of a second. By making allowance for this lag the chronometers in the Canal Zone can be adjusted to within about one-tenth of a second of the correct time. Arrangements are being made to install a clock at Darien which will transmit the time exactly as received from Key West.

COAL DEALER'S FIREPLACE MADE OF HARD COAL

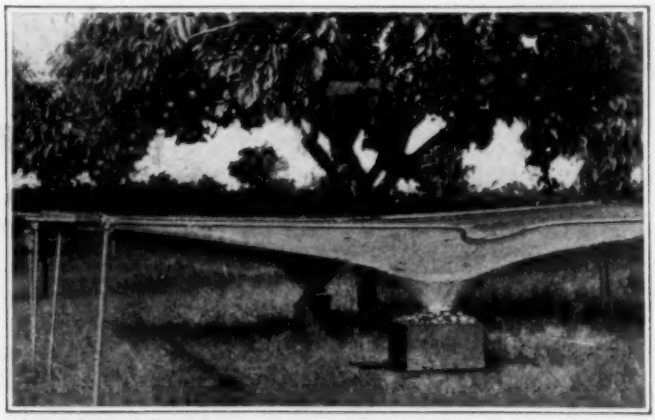
A prominent Ohio coal dealer, who has a fondness for things novel, has caused to be built in his new residence

Hard Coal Is the Material Used in Constructing the Outer Surface of This Unusual Fireplace

a fireplace in which pieces of anthracite coal of nearly uniform size were used for constructing its outer surface. The pieces of coal, hard and lustrous, constitute a striking and decorative feature of the new home. In a recess above the mantel a clock is placed. Imbedded in the masonry just above the clock, as may be seen in the illustration, are dark curved objects. These are turnings from a 16-in. gun made in one of the United States government arsenals.

SIMPLE FRUIT COLLECTOR SAVES LABOR

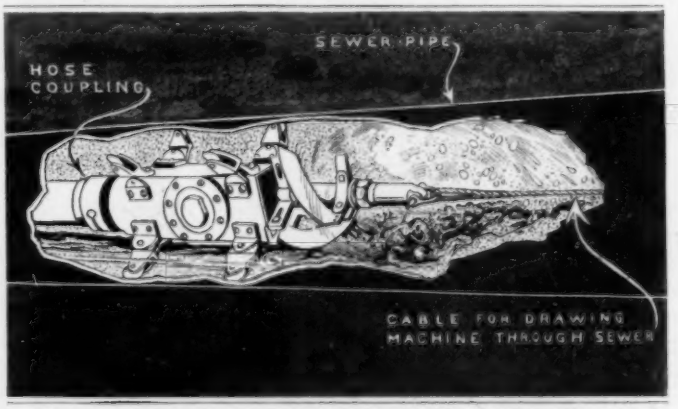
A fruit collector designed for harvesting prunes, but which can be used for other fruits also, consists essentially of a netting to be spread under a tree and onto which the fruit is shaken. The netting is supported above the ground by a frame of ½-in. iron pipe, measuring 7½ by 15 ft. Two such frames, set side by side, are used under one tree. A curve in one side of each permits them to be fitted closely about the trunk. The mesh can be of such size as to allow small fruit to fall to the ground. The netting is so slanted that the larger fruit rolls to an opening in the net's center and thence into boxes or pails. In this way it is kept out of the dirt. The frames can be folded up and moved easily. The device is patented. It is claimed that four persons with two collectors can shake and harvest as many prunes as 12 persons can by the old method of shaking and gathering from the ground.



All Fruit Shaken onto This Collector will Roll into the Receptacle Placed beneath the Opening Except the Small, and Hence Undesirable, Fruit Which will Fall through to the Ground

SEWER-CLEANING MACHINE FLOODS PIPE INTERIORS

A new cleaning machine designed to be pulled through a sewer by means of a cable and windlass recently received several successful try-outs in eastern cities. In one case a tight mass of roots, some of them half an inch through, was easily removed from a 12-in. main. The machine proper consists of an oblong block of metal, terminating at the front end in a rod and eye for the attachment of the cable. Just back of the eye is a group of spiral cutters, operated by a 3½-in. hydraulic motor within the block of metal itself. A fire hose attached to the rear furnishes the necessary water for operating the motor and for flushing purposes. Eight small arms project from the side of the machine, keeping it in the center of the sewer. The flow of water is an aid in cleansing the drain of semifluid matter.



Sewer-Cleaning Machine Uses Water from Fire Hose to Operate the Hydraulic Motor Which Propels the Cutter Blades

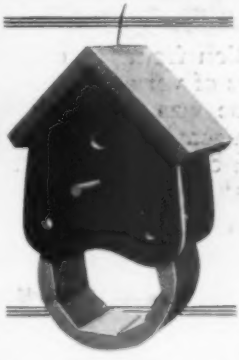
This Moving Floor in Main Dining Room of Prominent Broadway Restaurant Makes One Complete Revolution Every Hour

MOVING FLOOR INNOVATION AT NEW YORK CAFE

In one of the Broadway cafés at New York a merry-go-round dining and dancing space has lately been introduced. This consists of a revolving, circular floor, the outer edge of which is margined with a row of tables, while the middle part is reserved for fox-trotters. As is obvious, the floor is built on a turntable. It is 32 ft. in diameter, and in the center is inlaid with a round piece of plate glass, 6 ft. across, through which different luminous color effects are projected by means of concealed incandescent lamps. The floor surrounding this is stenciled to resemble marble mosaic. The turntable is driven by a ¼-hp. motor at a normal rate of one revolution an hour. Thus 30 minutes after guests have seated themselves at one of the merry-go-round tables they may be talking with friends around another table at the opposite side of the room. The movement of the floor is slow enough that an unobserving first-nighter might readily be confused upon realizing suddenly that both he and his table were some 15 or 20 ft. from the place they apparently should be.

CLEANLINESS OF HOUSE INVITES BIRD TENANTS

Because birds in many cases desire a clean nesting place for each successive brood, ornate and expensive bird houses are often of no value after the first year.



To get around this trouble a Battle Creek inventor has perfected a bird house that can readily be cleaned and thus made available for use each season. The house has a frame and a roof of ordinary sort, but the lower part consists of a cylinder held in place by pegs. When the feathered occupants have flown south for the winter, the pegs are removed, the cylinder drops down, and the nest and debris of the departed tenants are cleared away with the aid of a garden hose. When the birds come back from their winter vacation, they find the old nesting place clean and inviting.

PAPER OUTFITS PROTECT AIRMEN FROM COLD

Paper suits which are said to be equal if not superior to cloth or fur garments in keeping out the cold are now being manufactured to be worn beneath outer garments by airmen. Fliers frequently experience great difficulty in keeping warm when ascending to high altitudes, and paper, being a good nonconductor, furnishes excellent protection from the cold. The outfit shown is of very thin, tough paper, which can be washed and dried, and consists of a coat, trousers, loose-fitting socks, and a cap with earlaps.

OIL-FEED INDICATOR STOPS MOTOR AND LIMITS SPEED

An oil-feed indicator has been invented which automatically stops the motor car to which it is attached when the lubricating oil ceases to flow and also limits the speed of the motor to any predetermined maximum. The operation of this device is shown by the movement of a hand which oscillates across the face of a dial, set where it may be viewed by the driver. This hand, or indicating member, is actuated by a piston which is located in a tapered cylinder through which the lubricating oil flows. The pressure of the oil on the piston determines its position in the cylinder and hence the position of the hand. If the oil ceases to flow, because it is used up or clogged, the hand drops back to zero on the dial where is located a "motor-stop" pin. When the hand touches this pin it short-circuits the magneto through a ground wire, thereby stopping the motor. The speed control operates similarly through a pin at the opposite side of the dial which may be set to indicate any desired maximum. When the hand is forced, by excessive flow of oil, against this pin, it short-circuits the motor but does not stop it, as normal electrical connection is immediately resumed with a decreased flow of oil. The invention is adaptable also to motorboats.

DANGER OF ELECTROCUTION IN BATHROOMS

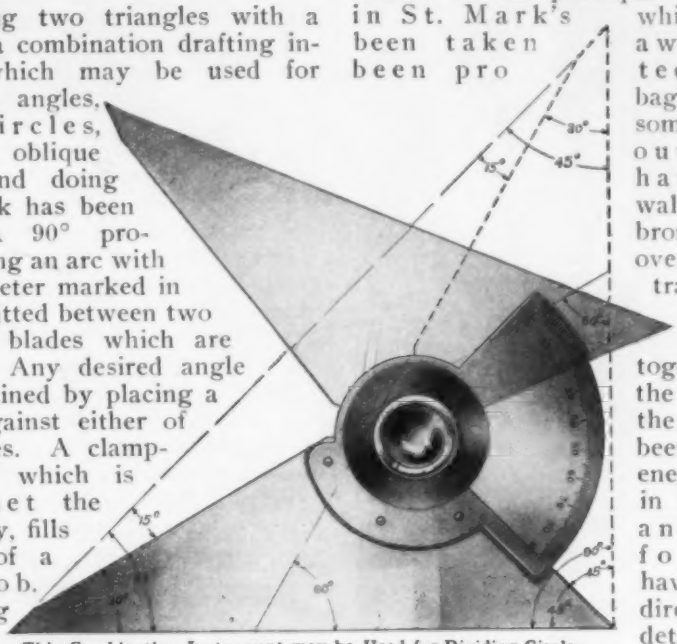
Few persons realize the risks which they may run when turning electric-light switches in a bathroom. Several lives are lost annually by accidental electrocutions which take place in bathtubs. In some instances these deaths have been popularly attributed to faulty insulation. But it has been shown that a bather, standing in a tub of water, by turning a switch with his wet hand may cause enough moisture to penetrate the electric socket and establish a circuit, thereby permitting the current to pass from the wires, through his body into the water and thence to the ground. Thus the body acts very much as a lightning rod.

Electrocution may occur if one hand is in a washbowl of water and the other, being wet, is used to turn a switch. If only the key is touched and no moisture penetrates, of course no ill effects will follow. Fatalities are believed to have resulted also when a bather in a tub has accidentally struck his head against a projecting light socket. The hair, if thoroughly

wet, may supply sufficient moisture in such cases to complete a circuit. Under these circumstances a current that is ordinarily harmless may cause death. This explanation is advanced regarding a fatality which occurred recently in an eastern state. Another accident, somewhat similar, occurred when a bather attempted to use an electric vibrator while sitting in a partly filled bathtub.

ONE TOOL COMBINES THREE DRAFTING INSTRUMENTS

By joining two triangles with a protractor, a combination drafting instrument which may be used for transferring angles, dividing circles, drawing oblique parallels, and doing similar work has been devised. A 90° protractor having an arc with a 4-in. diameter marked in degrees, is fitted between two transparent blades which are adjustable. Any desired angle may be attained by placing a T-square against either of the triangles. A clamping screw, which is used to set the blades firmly, fills the place of a thumb knob. By setting the instrument at 90°, two 60°, one 90°, two 45°, two 30°, and two 15° angles are obtained, as shown.



This Combination Instrument may be Used for Dividing Circles, Transferring Angles, and Doing Similar Work

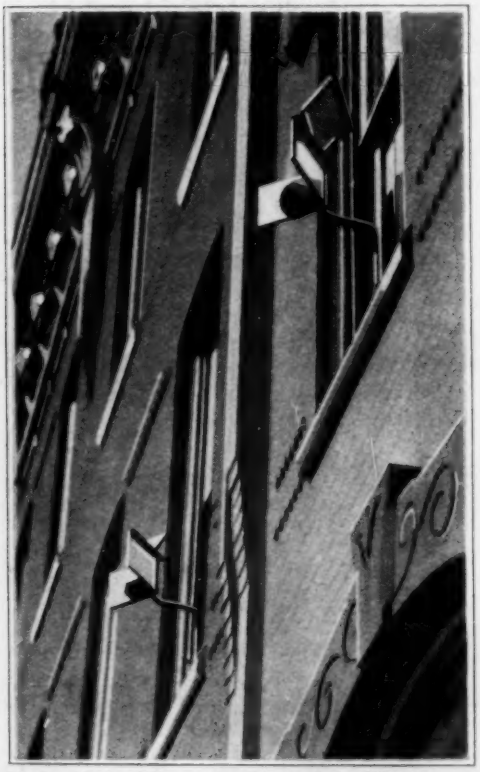
SAND AND MASONRY SHIELD OLD VENETIAN EDIFICES

Elaborate precautions have been taken by the authorities of Venice to protect their historic buildings and art treasures against aerial attacks. Water pipes have been carried to the roofs of St. Mark's cathedral, the doge's palace, and other famous structures. As additional safeguards against conflagration the upper parts of these buildings have been provided with fire extinguishers and sand bags. Small towers have been erected at the corners of the doge's palace for the especial protection of the sculpture. The archways of the palace facing the sea have been strengthened and protected by masonry, and the arches of the loggia have been underpropped with wood. In this way the palace has been formed into a single block, so that if a column or a portico should be shattered the rest of the building would remain intact. All the principal works of art in St. Mark's which have not been taken away have been protected with bags of sand; some of the outer arches have been walled in. The bronze horses over the entrance have been removed altogether, and the masonry of the cupola has been strengthened. Experts in architecture and military fortification have carefully directed every detail of this work, which has cost $40,000. The additional weight of the sand, masonry, etc., was calculated and distributed so as not to work any possible damage to the foundations or walls. All the protections have been so constructed that after the war they can be removed without damaging the original buildings.

"Merrimack" (not Merrimac) is the spelling approved by the United States Geographic Board for the name of the river that flows through Lowell and other Massachusetts cities.

OLD-WORLD MIRROR DEVICE ALSO USED IN AMERICA

A quaint old-world device, which in years past has found favor in Philadelphia and may still be seen on many of its older residences, consists of mirrors fastened on metal frames just outside windows of the second or higher stories, at such angles that they afford a person within the house several views of the street below. These mirrors have been nicknamed "busybodies" and are to be found on houses in many parts of Europe, where they have been employed for generations.



These Quaint Mirrors in Front of the Windows are Patterned after a Device Long Used in Europe, and are Found on Many Old Residences in Philadelphia: They Afford a Person within the House Several Views of the Street Below

One, two, or three mirrors are used. In case there are three, one is so adjusted that it affords a view of the street in one direction and a second reflects the view in the opposite direction; the third mirror enables one to see the front doorstep. This frequently is a great convenience and, for example, permits the user to ascertain who may be at the front door, before responding to a ring of the doorbell.

FREIGHT RATES AND RULES ALTERED BY NEW LAW

Important changes in the rules and rates governing the shipping of live stock have been inaugurated on the various railroads of the country in compliance with the Cummins act pertaining to interstate commerce. In the matter of live stock, the shipper must state the value of his stock, and the rates charged are fixed by a sliding scale according to the valuation given. This valuation governs the limit of the railroad's liability and hence is an important feature of the regulations. Under the new rules the shippers are allowed certain maximum values for various kinds of stock. When the values which the shipper gives do not exceed these maximums, the minimum freight rate is charged. When values given do exceed the specified maximums, the rates are increased a certain percentage. These increases differ in various parts of the country as do the maximum values under which minimum rates can be enjoyed.

MODERN KITCHENETTE MADE HOUSEHOLD LABORATORY

One of the interesting exhibits at an electric show held some time ago at New York was a model kitchenette which occupied a surprisingly small amount of space. Nearly all of the utensils and appliances with which it was equipped were electrically operated and designed to save labor and simplify kitchen work in particular and housework in general. In a space, 10 ft. long and 26 in. deep, were arranged all the things needed in the culinary department of a small residence or apartment and many things found in but few homes. It represented a combination kitchen and laundry in which every inch of space

The Most Disagreeable Work—Dishwashing—is Done Electrically

When the Dishes have been Washed, the Curtains are Drawn, Completely Concealing the Kitchenette

Right: The Pressing Board Slides Out of View When It Is Not in Use

COURTESY OF THE NEW YORK EDISON CO.

was utilized, and fire and ice unknown and unneeded. At one end was a well-equipped cabinet, and adjacent to it two wide shelves on which the various utensils were kept. Beneath these were a rack, sink, and washing machine. Space was provided for a portable vacuum cleaner, an electric refrigerator, air purifier, oven, stove, dishwasher and drier, and a sanitary garbage receptacle. An electric roaster, percolator, toaster, chafing dish, tea samovar, and other accessories of a like character were arranged on the shelves, which were finished in white enamel and kept immaculately clean.

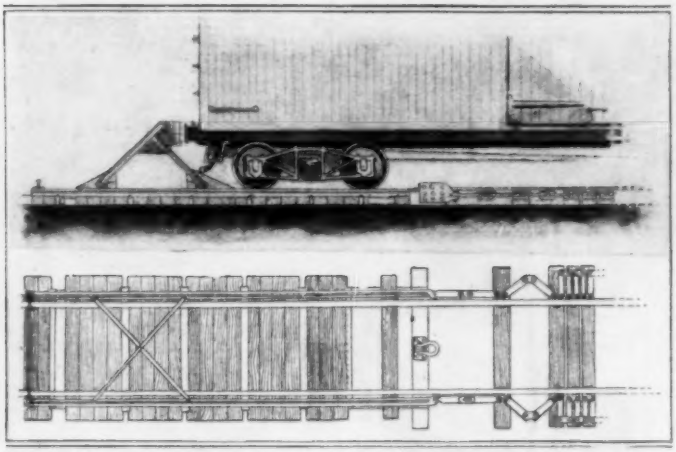
LONDONER ATTACHES KNIFE SHARPENER TO BICYCLE

An itinerant knife grinder in London has ingeniously attached his grinding apparatus to his bicycle by mounting a grindstone above the handlebars and connecting it by a chain with a grooved pulley which is fastened to the side of the back wheel. By means of bracing legs the wheel is lifted slightly above the ground. The grinder seated on his bicycle operates the grindstone by foot power. A watering can and a table over the front wheel, for cutlery not being sharpened, complete the outfit.

This Bicycle is Used by Its Owner both as a Vehicle and to Operate His Knife Sharpener

NEW SLIDING BUFFER FOR RAILROAD CARS

In a test of a sliding buffer that has just been brought out in France, a 200-ton train running at a speed of seven miles an hour was brought to a stop within a distance of 25 ft. without injury to the buffer or the rolling stock.



The Buffer and the Ties on Which It is Mounted Slide under the Impact of a Car, Bringing the Car to a Stop Gradually

The essential feature of this apparatus is a section of sliding ties which work in a concrete-lined channel and to which the buffer is attached by means of a triangular steel frame, as shown. The weight of the end car of a train, bearing on this section, produces the friction for stopping the train without causing too great a shock. The track rails are secured against sliding and are connected with the ties in such a way as to keep the rails to gauge without preventing the sliding movement. Outside each track rail and running parallel with it is a steel plate to which the ends of the ties are fixed. The two plates are connected by steel I-beams so that the entire section slides as a unit. At the approach to the sliding section are four or five ties connected by articulated plates which are normally folded. When a car strikes the buffer, the unfolding of these plates, with the resulting sliding of the ties to which they are connected, permits the main section to slide under the impact. The buffer is provided with a hook to which is attached a cable for pulling the apparatus back to its original position after the cars have been removed.

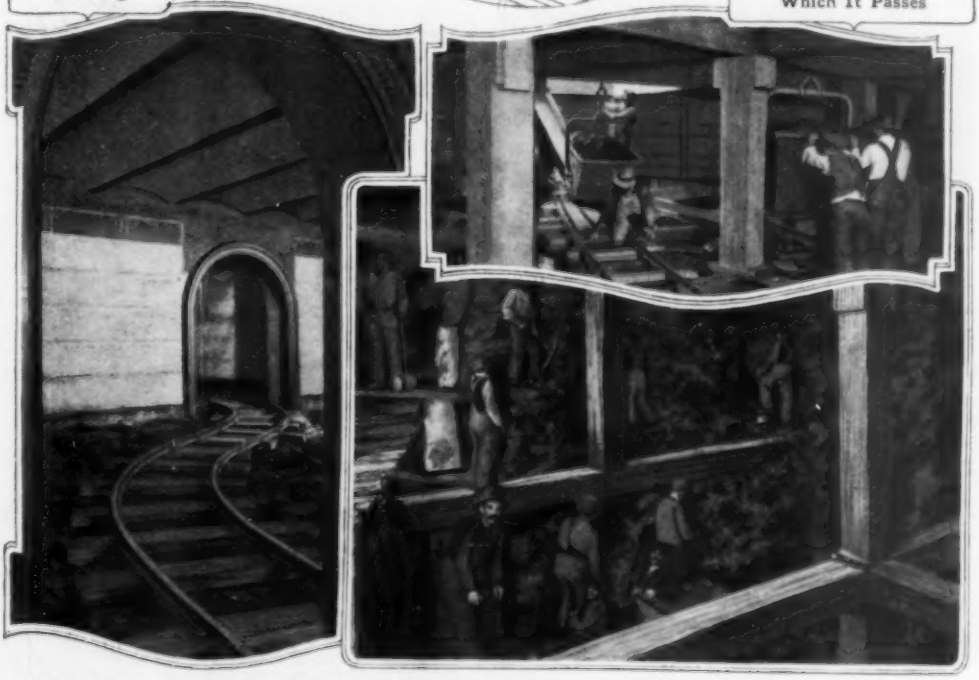
SUBWAY STATION SUPPORTS LARGE BUILDING

Quite an interesting piece of engineering is being accomplished at Philadelphia, where a four-track subway station is being built beneath the city hall. While the task is a more or less difficult one, as is most subterranean construction in large cities, it is not an unusual undertaking in most respects. The station will lie diagonally under the southwest quarter of the structure, which occupies a square block of ground and is one of the large municipal buildings of the country. When it is completed it will support that part of the weight of the hall which was formerly carried by the walls which have been removed to accommodate the subway. Likewise it will hold up the present Market Street bore. It is estimated that this load will amount to approximately 200,500 tons.

The underground work is being carried on without interfering in any way with the activities within the building, which is nine stores in height and surmounted by a 548-ft. tower. From the exterior there is also very little evidence of what is going on under the great building and the streets adjacent to it on the south and west sides. During the construction period a section of the building is being carried on underpinnings which have been set beneath the walls to permit the excavat-

Diagram Shows General Arrangement of Subway Station Now being Built beneath the Philadelphia Municipal Building

Broad Street Tunnel, "B," will Support Part of the Weight of City Hall Shown Above, and Market Street Tunnel, "A," beneath Which It Passes



Left: Dump-Car Track Extending through Basement of Building. **Above:** Hoisting Dirt to Wagons Waiting at Street Level. **Right:** Putting the Underpinnings in Place beneath Pavement

ing to be done. As the earth is removed it is scooped into steel buckets mounted on trucks. These are pushed to one of two conveniently located shafts where the containers are lifted to the street level and their contents loaded into waiting wagons and carted away. The cost of the work, which represents the initial step in the new system, will be approximately $1,300,000. The builders are allowed two and a half years in which to complete the undertaking.

DISHES WASHED BY MACHINE IN MINUTE'S TIME

Dishwashing is reduced to a simple, momentary operation by an ingenious machine recently developed for domestic purposes. Unlike many similar devices, it uses a small amount of water and performs its function quickly and with thoroughness. The device consists of a cylindrical sheet-metal tank, fitted with a series of vertical baffle plates around its inner wall, and supported on legs at a convenient height. The top is tightly covered, while the cone-shaped bottom is provided with a large two-blade propeller driven by a shaft to which a crank is attached. China is set on edge in racks placed in a round wire basket which is suspended in the machine, after about five quarts of boiling, soapy water have been poured into it. When the cover is applied, the crank is turned slowly by hand. The revolving propeller hurls the hot water with force against the baffle plates and upward among the dishes. Upon striking the vertical strips it is deflected so as to strike the china from every angle. Water is likewise forced against the cover and driven down upon the china. Glasses, bottles, pitchers, and similar articles, are placed upside down so that the water is shot directly into them. Dishes covered with mutton grease have been washed in this way in 35 seconds. A minute's time is almost always sufficient to complete the operation. Dishes in which eggs have been served can be cleaned in the machine, but preferably should be soaked a few minutes beforehand. When the basket is removed from the container the china is sprayed with hot water and set aside to dry. After being drained the machine needs only to be rinsed and dried. Its waste pipe may be permanently connected with a sink drain.

Only Four or Five Quarts of Boiling Water Need be Used with This Household Dishwashing Machine to Clean China Thoroughly in a Minute or Less

MUD IN BOILER CAUSES "BAG" IN ITS SHELL

An excellent example of what boiler men call a "bag" was found in a boiler of an electric-light plant at Carrington, N. D., recently, formed in steel 5/8 in. thick. A bag is in reality a blister, or bulge, in the steel, due to high pressure within and occurring in some portion of the shell which has insufficient strength. In this case the bulge was caused by mud which had accumulated inside the boiler because it had not been properly cleaned. The mud and scale at this spot, which was directly over the fire, were really baked to the shell. The boiler pressure was 150 lb. to the square inch. Since there was

Mud Which Accumulated in a Boiler Caused a Portion of Its Shell to Become Red-Hot. The Pressure within Produced This "Bag," Which Projects Eight Inches

With This Implement Many Loads of Dirt were Pushed over the Edge of the Bluff into a Depression Below

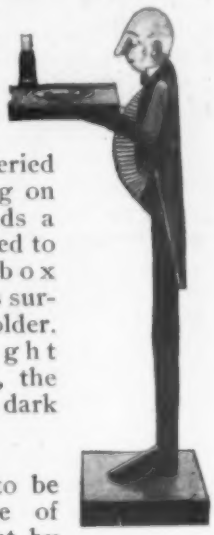
little or no circulation of the boiling water on the shell at this point, the furnace heated the steel red-hot. This of course softened the steel and it began to bulge at the weakened point. The farther the bag extended into the fire box the hotter it became. The distention finally projected 8 in. and burst, the escaping steam and water putting out the fire and shutting down the plant. No one was hurt. The bag was cut out, and a patch riveted in its place.

FOUR HORSES AND PUSHER DO WORK OF MANY MEN

While filling a deep depression near a railway station in LaSalle, Ill., the city authorities had occasion to dump much of the filling dirt at the edge of a steep bluff overlooking the low-lying land. Four horses, two men, and an implement of unusual design were used to push the dirt over the edge of the bluff. This pusher consisted of a wide plank, several feet long, to one face of which was fastened at right angles a section of a telephone pole. This latter member was placed between the two center horses, as shown, the forward end was fastened to a heavy neck yoke, and the rear end to the axle of two wagon wheels, to which the horses were hitched. A platform fastened to the axle and the pole enabled the drivers to raise the pusher from the dirt when desired by placing their weight at the rear of the platform. By using this implement the city was saved much expense.

ORNAMENTAL ASH TRAY AND MATCH HOLDER

A useful ornament for a smoking room is a match holder and ash tray which stands 3 ft. high — a convenient height for a smoker when seated. It consists of a wooden upright so designed as to represent a liveried house servant holding on his outstretched hands a wooden tray. Fastened to the tray is a match-box holder and sunk in its surface is a metal ash holder. Save for certain bright colors on the figure, the article is finished in a dark stain.



¶What is believed to be the largest package of motor parts ever sent by parcel post to a foreign country was sent recently from Racine, Wis., to Petrograd. It weighed 201 lb. and $96.84 was the postage cost.

CURRENT READINGS TAKEN UNDER DIFFICULTIES

To sit for hours at a time in a little wooden cage 40 ft. above the wind-swept Ottawa River, the temperature many times 40° or more below zero, is a task regularly endured by a meter reader in eastern Canada during the winter months. In order to avoid freezing it is necessary to wear a thick woolen cap, a fur overcoat, heavy mittens, four pairs of socks, a pair of moccasins, and sheep-skin boots. Even then it is difficult to remain out more than two or three hours at a time.

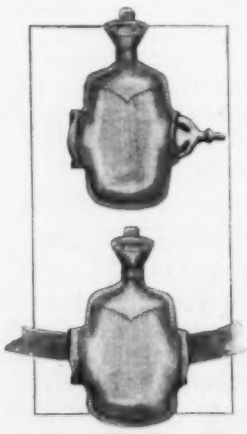
A cable stretched across the river supports the cage and rider. Beneath it hangs a current meter which indicates the rate at which the waters are flowing. Data obtained therefrom are useful in determining the availability of the stream for power purposes. Inasmuch as the shiny meter hanging in the water resembles a fisherman's troll, huge pike and pickerel occasionally attempt to swallow it whole.

FLOATING MASS OF PUMICE NEAR FIJI ISLANDS

A mass of floating pumice, some five miles in width and of unknown length, was encountered by a party which was recently cruising in a 10-ton motorboat among the Fiji Islands and other groups. Pumice is lava having a frothy or spongy structure which has been thoroughly permeated by gases. It is often so porous as to float on the water for a considerable time after being ejected from a volcano, but after its pores are filled with water it sinks to the bottom, its specific gravity being nearly two and one-half times that of water. The edge of the unusually large mass discovered by these voyagers seemed like floating froth and dust, and the boat moved through it easily. But later on there was difficulty in making headway, and at times the craft was brought almost to a standstill. The propeller could be heard striking hard lumps at each revolution and occasionally the pilot steered to one side to avoid solid masses, as much as 4 ft. in diameter. In some places the pumice was so compact that a native was able to stand on a small plank thrown on the top of it. The spongy material clogged the pipes of one of the engines, which had to be taken apart for repairs. It took nearly two hours to pass through this floating mass, which, on the sides, reached as far as the eye could see.

WATER BOTTLE DESIGNED FOR INFANT'S NEEDS

A hot-water bottle with an opening, or passageway, extending through it from side to side has been designed, which admits of a number of uses for which the ordinary water bottle is not suited. A nursing bottle inserted in this opening can be kept warm for a considerable time, thereby avoiding the inconvenience often experienced in securing warm milk for a baby. In hot weather the water bottle may be filled with chipped ice or ice water; so filled it will keep milk in a nursing bottle from souring. By running a bandage through the opening the water bottle may be easily and securely bound to any portion of the body.

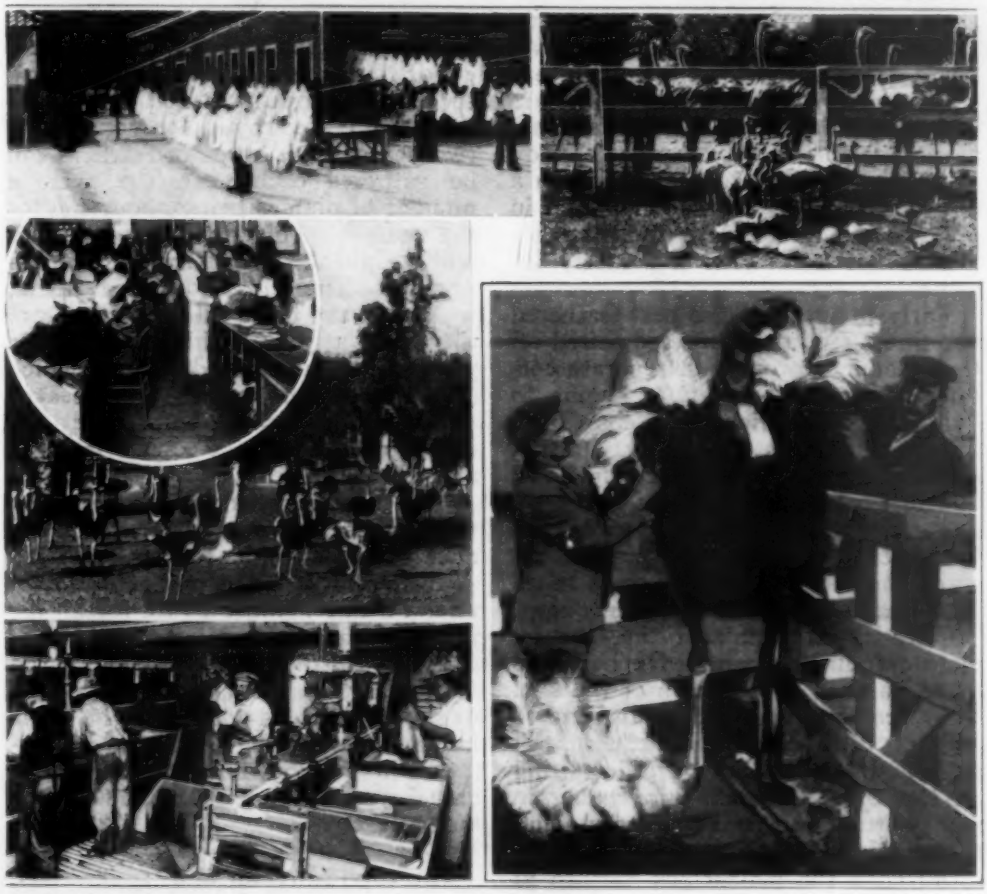


OSTRICH FARMING A PROFITABLE ENTERPRISE

By ROBERT H. MOULTON

ROAST ostrich is the latest dish provided by solicitous chefs to tempt jaded appetites, and it is said by those who have tried it to be quite a delectable morsel. It is safe to predict, however, that this huge, ungainly bird which we are accustomed to associate with zoölogical gardens and menageries will never become a popular short-order dish. In the first place, it takes an epicurean to appreciate them. And in the next, they are too valuable to be served up in slices and joints. A dead ostrich is worth only about $100 as an entrée—and once eaten, there is an end of him. But a live ostrich is worth anywhere from five to twenty times this amount, because he produces each year from $50 to $150 worth of feathers, and can keep this up for 50 years or more without any appreciable effort. Some have been known to yield excellent plumage at the age of seventy-five.

Ostrich farming in this country is as yet in its infancy, but its possibilities seem to be attracting the attention of investors. In normal times an average of $5,000,000 worth of ostrich feathers have been imported into the



Top, Left: Washed and Bleached Ostrich Feathers Drying; Right: Ostrich Eggs, Chicks, Some of Which have Just Hatched, and Full-Grown Birds. In Circular Insert Workers are Shown Packing Feathers for Shipment, and below It Is a View of a California Ostrich Farm. Bottom, Left: Washing and Dyeing Feathers; Right: Plucking Ostrich Feathers

United States from Asia and Africa each year, notwithstanding the import duty of 20 per cent on the raw and 60 per cent on the prepared feathers. It has been found that the ostriches raised in this country produce plumage fully equal and in some instances superior to that imported from abroad. There is, therefore, no reason why this large sum should not be diverted to the pockets of American ostrich farmers.

There are a number of states where the climate is ideal for the propagation of these birds. At the present time there are ostrich farms in Arizona, Arkansas, Texas, California, and Florida, with an estimated total of 8,000 birds as against less than fifty, 20 years ago, most of which were in circuses. Certain sections of the Salt River Valley in Arizona, where alfalfa and lucern can be grown on irrigated lands, are especially adapted to ostrich farming, as one farm in that locality has already proved by its great success. Fifty or a hundred acres of this land planted in alfalfa and stocked with ostriches should net the owner a princely income.

Early in the year the best-feathered and finest strain of birds are paired off for breeding purposes in separate corrals. The male bird then begins to build the nest, which is merely a hole, about three feet in diameter and a foot deep, hollowed out in the ground. The female deposits her eggs in this nest, one every other day until about 15 have been laid. Each egg weighs about three and one-half pounds or as much as two and one-half dozen hen's eggs.

Contrary to popular belief, the female ostrich does not leave her eggs to be hatched by the rays of the sun. They are simply covered with sand to protect them from the heat. Both male and female take turns in sitting on the eggs, the male bird being in steady attendance during the night and the female during the day. At the end of 40 days the little chick incased in the egg begins to pick at its shell. At this time the farmer removes the eggs to a separate inclosure, where he carefully liberates the little ostriches. The mother bird, thus relieved of her first hatching, is ready for another nest of eggs and forthwith takes up the process of reproduction once more.

Each female bird lays an average of 55 eggs per year, from the age of four until she reaches middle life at 35. Thereafter until the end of her life chapter, at the age of about 60, she produces no eggs. Ostrich eggs are valued at about $5 each.

During the first six months the little chicks grow with amazing rapidity, averaging a foot in growth each month. Between the ages of six and ten months, their feathers are regularly plucked at short intervals. After this period they are examined every two months, and all "ripe" feathers plucked, care being taken that none of the sockets or roots are pulled, for whenever a socket is removed the feather-producing seed is destroyed forever. After two years, three crops of feathers can be gathered each year, the average number of plumes being about 400 for the season. This number of plumes will weigh about one and one-fourth pounds. The glossy black feathers, which are the most valued, come from the male ostrich, while the female yields the drab-colored plumes which go through the various processes of dyeing and bleaching before they become an adjunct of women's fashionable headgear.

The value of ostriches in comparison with cattle shows a large preponderance in favor of the former. A head of cattle, for instance, will eat 60 lb. of alfalfa a day against 10 lb. for an ostrich. At five years of age this head of cattle is worth perhaps $40, while an ostrich at the same age is worth $300, or more. There is nothing to the cattle but meat, while at 10 months the ostrich will produce $10 worth of feathers, and thereafter from $50 to $150 worth annually.

¶The driving of an 8-in. silver rivet, instead of a cornerstone laying, marked the beginning of the erection of a New York skyscraper recently.

Each Employe is Allowed an Hour's Exercise Each Day the Weather Is Agreeable. An Alert, Efficient Business Organization Is the Result

ATHLETIC FIELD ON ROOF OF BUSINESS HOUSE

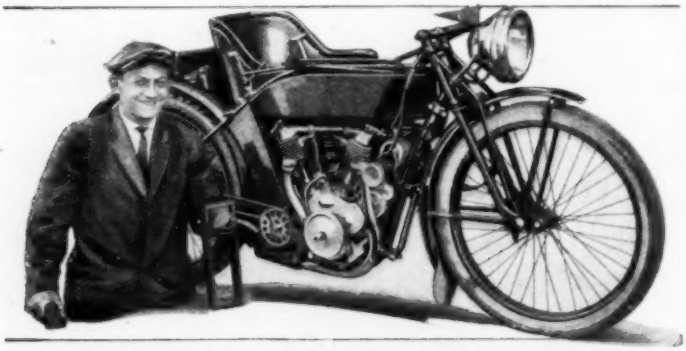
For the benefit of its employes, a large Philadelphia business concern has established a well-equipped athletic field on the roof of a 12-story building occupied by it in the city's commercial district. A rectangular cinder track extends around the outer edge of the building and is used by long-distance runners, while at one end there is a fast oval, suitable for 220-yd. and 440-yd. sprinters. A 100-yd. straightaway has also been provided by utilizing one side of the oval course. Adjacent to this and entirely inclosed in large cages are two basketball and two tennis courts. A bowling alley and spaces for various mild forms of exercise are also provided. It is appreciated by the company that to have a highly efficient working organization every man in the force must be in physical trim. The athletic field was thus conceived. So that it may be properly used, the company allows its employes one hour in which to exercise every day the weather permits. This gives ample time for the men to put on athletic suits and go through a workout.

AERIAL TOP FLIES AS IT SPINS

A novel top which mounts into the air as it spins is being produced by a Chicago manufacturer. It consists of a handle and parallel shaft, at the upper end of which is a fan wheel, or propeller, with several curved blades. The wheel is fastened solidly to its shaft, which turns easily in two sockets made by curved projections adjoining the handle. By winding a string tightly about the shaft and pulling it as is done in top spinning, the resulting rapid revolutions of the wheel will make the toy rise as high as, or higher than, an ordinary dwelling house. The ring around the fan wheel furnishes protection against cutting the fingers.

ONE-ARMED, LEGLESS MAN MOTORCYCLE TOURIST

With a motorcycle that is especially adapted to meet his physical limitations, a Los Angeles man, who has suffered the loss of both legs and the left forearm, has crossed the continent twice by making an overland trip from California to New York and return. The machine driven by him on this lengthy journey is provided with a sidecar which is used in lieu of the customary seat. Instead of depending upon handlebars, a lever arranged on the right side of the auxiliary car enables the cyclist to steer with his one available arm. The motor and clutch are controlled by small levers fastened to the frame at the top of the machine, where they are within easy access. Between the cycle and its sidecar another lever is arranged so that the engine may be turned over without help. The braking is accomplished similarly.

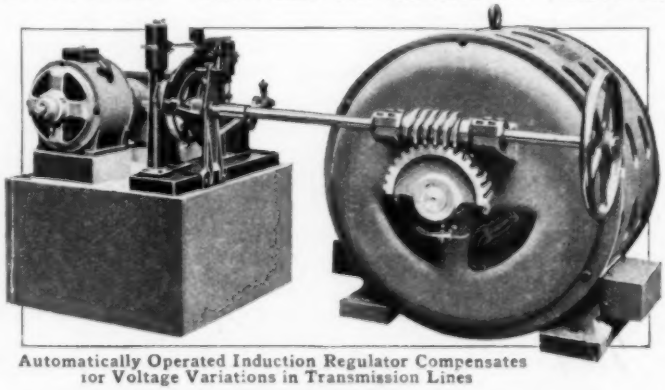


With This Machine the Maimed Rider Makes Overland Trips without Difficulty

LIGHT DIMMING PREVENTED BY NEW REGULATOR

Electric-lighting companies frequently find it difficult to maintain a constant voltage at a consumer's installation, and as a result lamps sometimes grow dim, or flicker perceptibly, every time a motor, or other heavy load, in the vicinity starts up. The reason is that too much current is being drawn from the line, and as a result the pressure, or voltage, falls off. As at present equipped, most power companies cannot at the moment raise the pressure on a particular line, and the consumer must, as a consequence, worry along with the lowered voltage and dimmed lights until the load in his district falls off.

A Swiss device lately developed is intended to remedy these difficulties. It aims to keep the pressure on a given line at all times constant, and consists principally of an induction regulator arranged to be operated automatically by an instrument sensitive to shifts in voltage. An induction regulator is much like the transformer visible on most any electric-light pole, except that its primary is mounted on an axis, and is capable of rotation much as the armature of an induction motor. The rotor is, however, kept from revolving by a toothed gear on one side. Shifting the relative positions of stator and rotor by means of this gearing,



Automatically Operated Induction Regulator Compensates for Voltage Variations in Transmission Lines

Above: This Light Hunting Boat can be Carried by Motor Car from One Desirable Lake to Another without Inconvenience

Left: A Roadster Carrying a Complete Hunting Outfit, Including a Boat Strapped to Iron Supports above the Passengers

raises or lowers the voltage impressed across the line beyond the regulator. Thus, with sensitive electromagnets to work pawls operating this gearing, stator and rotor may at any moment be set automatically so as to compensate for any falling off in the line voltage, and by this means current, as delivered to the consumer, comes at a uniform pressure. The contrivance may be connected with any individual lines going out of a plant, or to the main leads coming from the generator. It is most effective, however, when connected only into the local circuit of the troubled district.

ROADSTER CARRIES BOAT AND HUNTING OUTFIT

A California duck hunter has so altered his cut-down roadster that it carries his boat, tent, bedding, and many other camp necessities, conveniently and compactly. The most striking feature of this utility car is the manner of carrying the boat. Two iron rods are fastened either side of the machine, just ahead of the windshield. They are connected at the top by a rubber crossbar, bent down slightly to accommodate the curved top of the boat. Two rods, just back of the seat, are similarly placed and also are braced. The boat is placed on these two crossbars and firmly strapped in position as shown. The oars are strapped within the boat. The craft weighs only 80 lb. and can be removed quickly, enabling the hunter to get within range of many ducks that a hunter with high boots could not reach.

To make the skiff as light as possible the seat has been removed, and when one is needed a motor-car seat is used. The craft has proven a satisfactory foundation for a bed, the car seats being placed in the cockpit and used as a mattress, bedding being spread over all. An "A"-tent, blankets, and cooking utensils are carried on a platform at the rear. A spacious trunk has compartments for food, and fishing and hunting materials.

GLASS MAIL BOX PRESENTS ARTISTIC APPEARANCE

A mail box similar to ordinary types except for a glass front and sides, is being offered householders interested

A Mail Box, Chiefly of Plate Glass and Polished Wood Which It Is Unnecessary to Open to Ascertain Its Contents

in new conveniences for the home. Because of the transparency of the walls, letters deposited in the box may easily be seen from a distance without the trouble of making a special trip to the box. Being made of plate glass and polished wood, the trim appearance of the contrivance is a special feature. The front is made to be tilted outward for the removal of mail. A metal clip at the top holds papers and packages too large to go within.

¶A flying boat is a part of the equipment of a party of oil prospectors bound for interior Colombia.

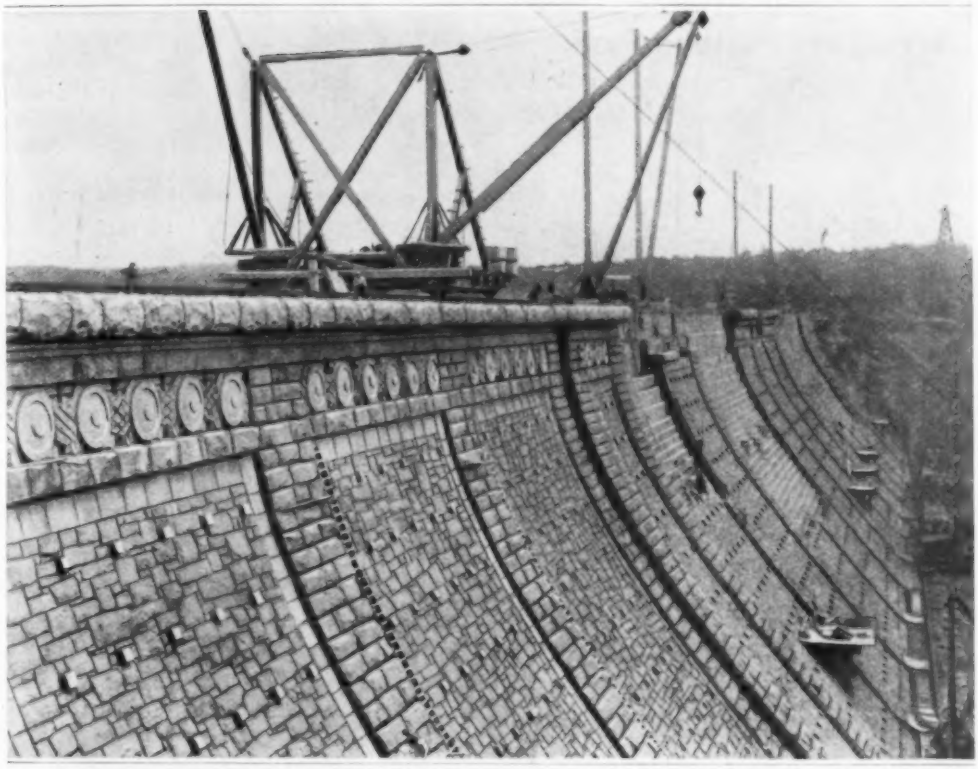
DRIFTWOOD A RICH HARVEST FOR RIVER LUMBERMAN

From 150,000 to 300,000 feet of lumber, chiefly cottonwood, is the harvest gathered annually by a sawmill owner on the Missouri River, who makes a special business of sawing up driftwood. Most of the collecting of this stray material is done in the early summer after the freshets have subsided, leaving much good material in their wake. Men go far up and downstream getting out logs and trees, some of which have been uncovered after being imbedded in the sand or under the water for years. This material is sawed into lengths, made into rafts, and floated downstream to the mill where it is cut into lumber, chiefly of a cheaper grade. The logs which have been partly submerged frequently are found to be damaged, but those that have been kept from the air by being wholly under water, even if for decades, generally are in good condition.

BEAUTY AS WELL AS BIGNESS A FEATURE OF NEW DAM

The Kensico dam, which is notable both for its size and for an architectural treatment that possesses individuality and massive beauty, is now being filled with water. Located 13 miles from the northern boundary of New York City, it is already one of the chief objects of interest in that municipality's new water system, which the first of the present year brought water from the Catskills for the first time, though for testing purposes only. Since this public engineering undertaking is situated on many arteries of travel, special consideration has been given to its architectural features, the designs and materials used being selected with a view to conveying a sense of the real vastness of the barrier.

As has been previously noted in Popular Mechanics Magazine, this dam was built to supplement the Ashokan dam, 75 miles farther north, thus establishing a reservoir which can be



The Downstream Face of the Kensico Dam, Showing the Paneled Granite Facing Partly Finished. The Stones of the Torus Are Four Feet Thick and Weigh from Nine to 14 Tons Each

drawn upon in case repairs are needed in the long Catskills aqueduct.

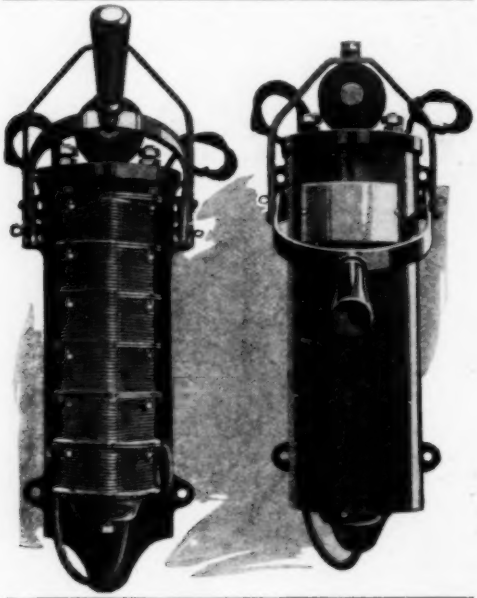
The Kensico reservoir represents an expenditure of nearly $8,500,000; its water surface will have an area of 2,218 acres. Excavations for the foundation extended to solid rock, 140 ft. below the original lowest level of the valley. The dam rises 170 ft. above the original level, and is more than 1,800 feet long at its crest. The bulk of the masonry is of cyclopean concrete, that is, irregular masses of stone bound together by concrete. The upstream surface is faced with concrete blocks. Provision for expansion and contraction is made by dividing the dam into sections with expansion joints, supplemented by great strips of copper.

The downstream face of the dam is of local granite, ranging in color from gray to pink and marked with russets and reds. The panels made by the expansion joints constitute the motif for the decoration on this face, their position being outlined by heavy rows of projecting, rough-faced stone, adjacent to which is a row of smooth-faced stone. The body of each panel is composed of rough stones, a large percentage of which have a face area of more than six square feet. The joints are wide and recessed. At regular intervals square stones project slightly. The stones in the torus are 4 ft. high and weigh from 9 to 14 tons each. The simply designed frieze is 6 ft. 6 in. high, some of the stones weighing from 10 to 14 tons or more.

Terraces, long pools, and playing fountains form the central features of a park extending downstream from the base of the dam and far up the hillsides, which are reached by ramps and driveways that wind amid the forests and offer views of the dam from many angles.

COMPACT MOTOR CONTROL OF INTERESTING TYPE

On the Pacific coast a compact controller of somewhat novel design has been introduced for use with direct-current electric motors. It differs in a number of points from many of the more commonly known starters, and among other things is without sliding contacts and springs. The wire forming the resistance element is wound about a series of insulated brass spools which are arranged vertically one above the other and suspended on insulating bushings from the cast-iron frame, or back, of the controller. When the manual switch is entirely out of contact the several coils are separated from each other. These members are brought together, however, as the handle is pushed upward. When in final position, all of the spools are connected end to end, the resistance is cut out and the motor runs at full speed. A magnet at the top of the frame holds the hand lever in position. In case of trouble this acts as a "no-voltage release," causing the lever to drop, thus breaking the contact and saving the motor. The operation of the controller can be made automatic by providing a solenoid magnet at the upper part of the frame, substituting it for the handle.



In Addition to being of Compact Size, the Starter Is without Sliding Contacts or Springs

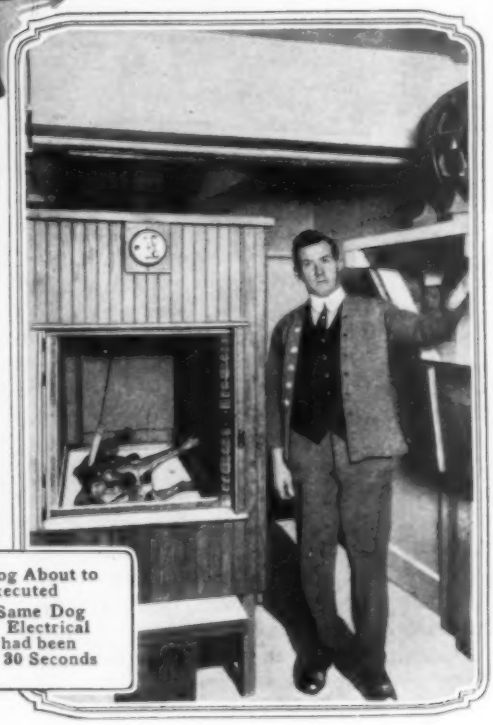
ELECTRICAL CABINETS FOR EXECUTION OF ANIMALS

The Animal Rescue League of Boston has perfected electrical apparatus for killing animals by a method which is humane and in other respects very desirable in that the animals killed endure no suffering, the operator is placed in no danger and engages in no brutalizing practices. Two different execution cabinets have been made, one for dogs and the other for cats. The former, which is the larger of the two, is about 2½ ft. wide and 4½ ft. high, with a door in front. The inside walls of the cabinet are electrically insulated. The apparatus for dogs has a metal floor or pan upon which the animal stands. From a metal bar above the dog's head hangs a strong chain with a snap hook at the lower end. The pan is connected with one pole of a high-tension current and the bar with the other pole. A metal collar with suitable electrode points is placed about the dog's neck and fastened to the chain. When the door is shut a circuit is formed and the animal is rendered unconscious instantly. The current is kept turned on for half a minute. Experts assert that an animal so executed endures no suffering and its appearance after death seems to confirm that statement.

The cabinet for cats has a door at the top which is opened by a foot lever attached to a cord that runs over a pulley and to a spring latch in the door. This permits the attendant the free use of both hands. Within, at either end of a slate tray, are metal electrodes. The animal is placed with its fore feet on one electrode and its hind feet on the other. Partly because

The Large Cabinet is Used for Executing Dogs; the Four Smaller Cabinets Are for Executing Cats

An Executed Cat After the Electrical Current had been Turned on One Minute



Left: A Dog About to be Executed
Right: Same Dog After the Electrical Current had been Turned on 30 Seconds

of the cat's greater powers of resistance the current is kept on a full minute. Current from an ordinary commercial lighting circuit is sufficient to operate these cabinets, which have already been installed in 20 communities in Canada and the United States.

SIMPLE LOCK IS DESIGNED FOR LIGHT MOTOR CAR

In an attempt to prevent the theft of certain light cars, a rather ingenious lock is being used which is apparently

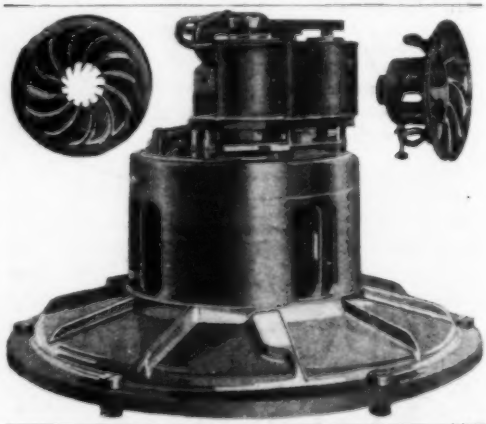
With the Lock Engaged a Car can Only be Driven or Towed in a Circle

as effective as it is convenient for a motorist. It is made of malleable steel in two parts; a clamp which fits about the steering wheel and over one of its spokes, and a hinged door, containing the lock proper, which is mounted on the steering column. When the device is in use the front wheels of a car are turned slightly to one side and held firmly in that position, making it possible only to drive or tow the machine in a circle. A high-grade lock is employed, and all screws, bolts, and joints are covered. The locking is done automatically from the seat, which forms a convenient feature for the user. When it is not engaged the door lies back against the steering column out of the way of the driver.

BATTLESHIPS SIGNAL WITH AIR SIRENS

To permit the flagship of a fleet to communicate with the other ships quickly and efficiently, the French are adopting an air siren. Mounted on top of a mast the sounds given out by this device may be heard from one to two miles. By its use signals may be transmitted even in foggy weather at a time when flags or other visual signals are inoperative. The air siren also relieves the wireless of much short-distance work, thus leaving the latter free to communicate with the shore or longer distances.

The machine consists of an electric motor having a vertical shaft on which are three powerful fans. These drive a stream of air at great velocity up through a cylinder at the top of the machine. This is perforated with a large number of holes through which the air escapes, the cylinder at the same time revolving at great speed past several oblong openings in an outer cylinder. This produces rapidly interrupted jets of air, and causes the machine to give forth a shrieking sound after the manner of the usual siren. Interposed between the upper



Air Siren Used as Battleship Signal over Short Distances

cylinders is a shutter operated by an electromagnet. Hence, by the simple manipulation of a key, the machine may be made to give off Morse signals as in the ordinary telegraph system.

Cleaning the Teeth of a Collie, One of the First Patients Cared For in the New Dental Department of a Boston Hospital for Dumb Animals

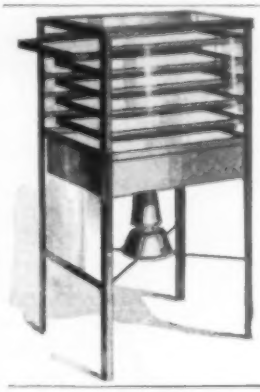
DENTAL ROOM FOR ANIMALS IN BOSTON INSTITUTION

In order that the teeth of domestic pets may be given proper attention, a dental department has of late been established in the Angell Memorial Hospital, a Boston institution for the medical and surgical treatment of dumb animals. Dogs, cats, and other animals are cared for by experienced practitioners who work upon them with almost as much care as if they were human. Even to many admirers of dogs, the thought of giving attention to an animal's teeth may possibly seem odd. Yet the importance of doing so is very apparent to anyone who realizes the close connection between good teeth and good health. So far the dental work has been confined chiefly to cleaning teeth, treating infected gums, and extracting, now and then, a decayed tooth. The department, however, is well equipped with instruments, and it is understood that other work will also be undertaken.

¶An American firm is now making the finest quality of photographic raw paper. Formerly this came chiefly from Germany and France.

LOW-PRICED SEED TESTER OF SERVICEABLE TYPE

For the advantage of both the retailer and large consumer, a comparatively inexpensive germinator has been developed for testing the quality of seeds before they are disposed of or planted. It consists of a lamp-heated glass case which accommodates five corrugated trays. The longitudinal depressions in the latter are partly filled with water, while blotters are placed across the top of each. Garden, field, and flower seeds are arranged on these absorbent sheets and the temperature then maintained at from 68° to 86°. After the blotters have once been moistened by sprinkling, the evaporation of the water in the several trays keeps them uniformly dampened. By dividing each tray into



several sections a number of varieties of seeds may be tested simultaneously. The interior of the cabinet is always visible, and since the seeds are exposed to daylight they germinate rapidly. Usually six days are sufficient to complete tests made with barley, corn, oats, rye, and wheat, while eight days are required for timothy, beets, tomatoes, beans, and cotton.

WATER-COOLED BREEZES EMANATE FROM NEW FAN

The cooling effect of evaporating water is utilized in an attachment for an electric fan lately invented. Fast-

ened to the front guard wires of the fan is a hooplike contrivance having at its bottom edge a small tank containing water. Within the hoop a wheel of windmill type revolves under the influence of the breeze from the fan. The blades of the wheel are made of screen, or light gauze, and dip into the tank at each revolution, getting dampened in the process. The breeze from the fan tends to evaporate the water from these blades as they swing upward, causing a consequent cooling of the air current as delivered into the room. The dampness carried along in the breeze adds to the cool feeling of the air.

AUSTRALIA ALONE PRODUCES COSTLY BLACK OPALS

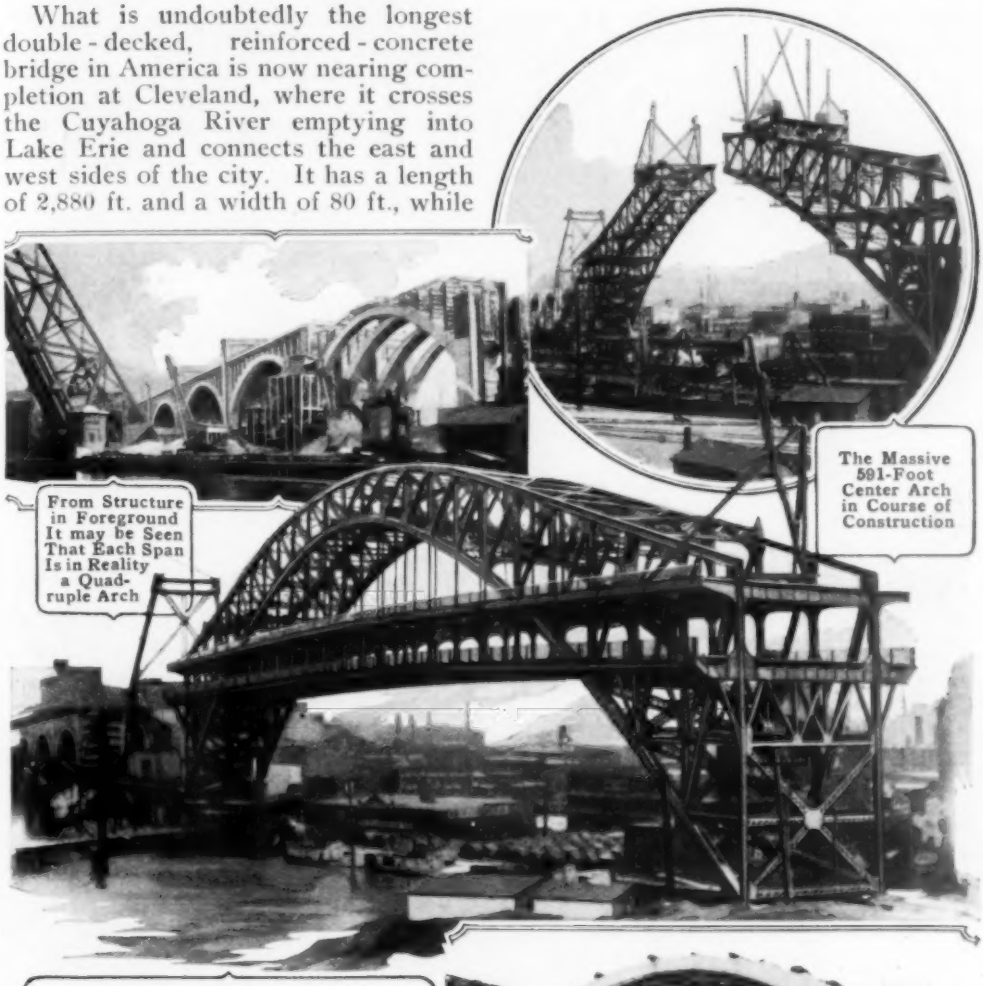
What are rather misleadingly called "black" opals, to distinguish them from "light" opals, are regarded as among the costliest of jewels, their price, carat for carat, being in excess of diamonds. These precious stones were almost unknown until recent years; they are much more rare and many regard them as more beautiful than diamonds. These gems possess marvelous, changing colors, ranging from bright, green-glowing fire to gold and lavender. They are found in one region only, a comparatively small tract of land in New South Wales. It is a wild and desolate area about 500 miles from Sydney. There is nothing to guide the miner in selecting a likely spot. The shafts average 40 ft. in depth and all rock has to be brought by bucket to the surface. Water and food are scarce, but the man who finds the gems makes his fortune. The Australian government had an exhibit of these stones at the exposition in San Francisco.

ICE IS USED IN ORCHARDS TO RETARD BUDDING

Near Luling, Texas, a number of orchardists are trying out a rather interesting plan of retarding the budding of their fruit trees until all danger of damage by late frosts has passed. The experiment consists of burying about 50 lb. of ice around the base of a tree when the weather becomes mild early in the season. This supply is replenished at intervals of two weeks until it is safe to allow the trees to burgeon. Ice is being supplied to several growers by a local producer to encourage the tests with a few trees. Although a considerable expenditure would be represented were the scheme carried out on a really large scale, it might not prove excessive if successful in preventing crop losses. Late frosts are a source of much anxiety to growers of early fruits, not alone in the South, but elsewhere as well.

GREAT TWO-LEVEL BRIDGE ERECTED AT CLEVELAND

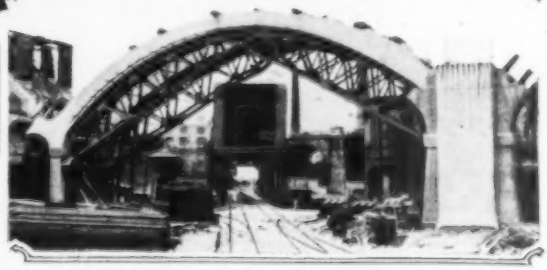
What is undoubtedly the longest double-decked, reinforced-concrete bridge in America is now nearing completion at Cleveland, where it crosses the Cuyahoga River emptying into Lake Erie and connects the east and west sides of the city. It has a length of 2,880 ft. and a width of 80 ft., while at its highest point it is 200 ft. above the water. The center arch, which is built of structural steel, has a length of 591 ft. and is exceeded in size by only a few single-arch spans in this country. The bridge has been carried to a height sufficiently great to enable the largest ships navigating the Great Lakes to pass beneath it without interference. When the river is at its normal stage, the structure gives a clearance of 96 ft. The lower deck will be reserved for the use of surface-traction lines and will provide space for six tracks. The upper level will accommodate both vehicular traffic and pedestrians. In



The Massive 591-Foot Center Arch in Course of Construction

From Structure in Foreground It may be Seen That Each Span Is in Reality a Quadruple Arch

Great Steel Arch After It had been Completed and the Two Decks Suspended from It



One of the Concrete Arches Showing the Temporary Steelwork Still in Place

constructing the long series of arches supporting the structure, temporary steel arches were erected to hold the concrete forms in position until the material had set sufficiently to permit their removal.

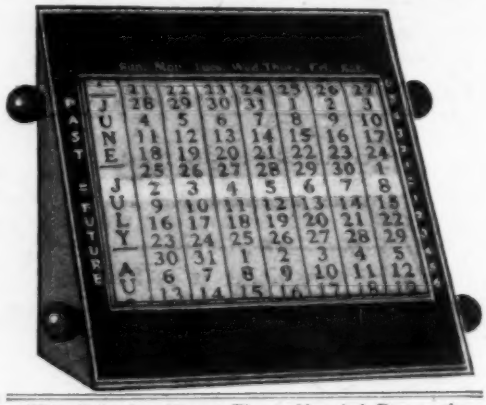
TWO-TUB WASHING MACHINE FOR HOUSEHOLD USE

For domestic use a twin-tub, power-driven washing machine has been brought out which has a number of good features. It is mounted on a movable steel rack provided with a folding shelf, on which a rinsing tub and clothes basket, or bluing container, are intended to be supported. A reversible power wringer so designed that it may be used in different positions by moving it to one side or the other, is held on a swinging frame. All of the gearing is incased and there are no rocker arms, chains, or rack bars exposed. In using the machine it is intended that soiled clothes should first be placed in one tub and subsequently run through the power wringer into the second washer. When this operation has been completed another batch of clothes may be put in the first tub so that both sides are in use. When the articles in the second container are thoroughly cleaned they are again put through the wringer and dropped into a rinsing tub on the folding shelf, after which the clothing in the first tub is transferred to the second, and a third lot put in the first one. From the rinsing tub the clothing may be wrung into the bluing receptacle and then into a basket. By following this system the machine is almost continuously in operation.

The Machine Occupies Only About Eight Square Feet of Floor Space

THIRTEEN WEEKS OF DATES SHOWN ON DESK CALENDAR

A desk calendar has been designed recently which shows thirteen weeks at one time, and by the turning of projecting rollers upon which the whole year's figures are wound, can be adjusted from week to week. When correctly placed the current week appears as the center line across the face of the calendar, the six past weeks appearing above it and the six weeks in the immediate future, below it. By an ingenious feature of construction the current week stands out more prominently than the others, the background for these figures being made to appear whiter than the others. New calendars can be inserted much as a film camera is loaded. The front of the frame is of red leather. A patent has been applied for.



This Calendar Shows Three Months' Dates, the Current Week Standing Out from the Rest

FINE SPECIMENS OF MOSAIC IN MEMORIAL CHAPEL

The Effect of This Mosaic on the Façade of the Church is Most Striking

Interior of the Church, Showing Extensive Use of Mosaic

Left: "The Last Supper," One of the Large Mural Decorations

One of the outstanding features of the Stanford Memorial Church, which is now nearing completion at Leland Stanford University, is its wealth of mural decorations in Italian mosaic. More than 1,600 sq. ft. of this, most of it consisting of reproductions of famous paintings and Biblical scenes, cover the interior walls as well as the façade of the edifice, which has been in course of construction since 1906, when it was practically demolished by earthquake. The work has been executed by Venetians brought to this country for the purpose.

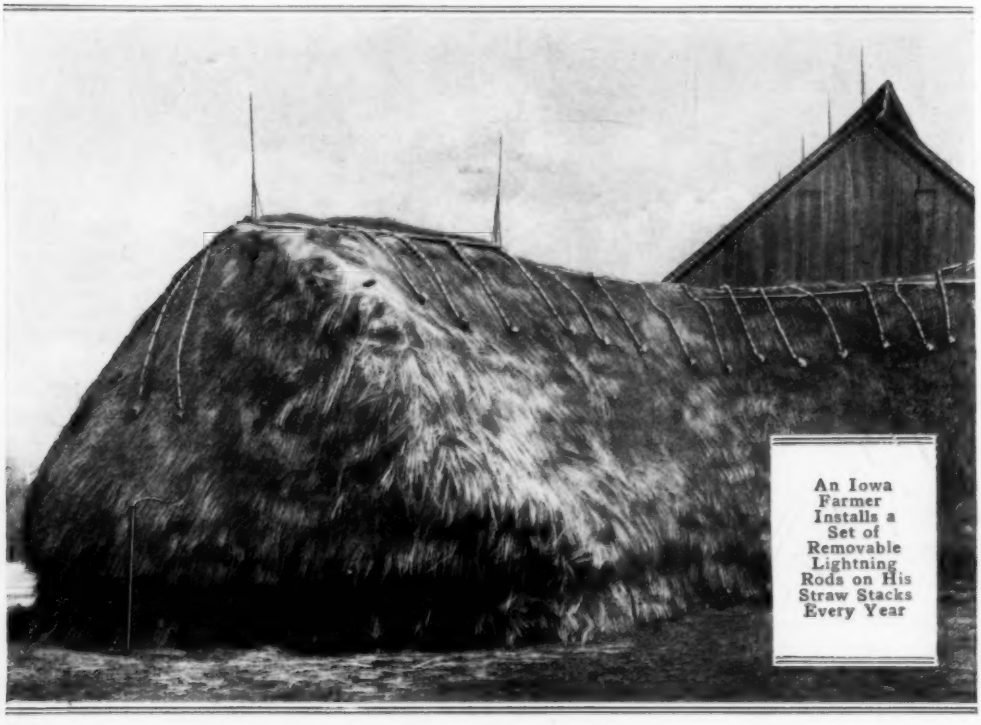
Mosaic decorations of this type have never been implanted in America to the same extent that they have in certain European countries, particularly in the South and in Greece, where the art is supposed to have originated. Although marble, mother-of-pearl, and some other materials, have long been used in this work, mosaics in glass predominate. This is because of the superior lasting qualities of the latter substance and the fact that it is impervious to the effects of most acids. Potash-lead and sodium-lime glasses are most commonly employed. The

glass is readily colored to correspond to the different shades and tints of the painting to be reproduced, by melting various metal oxides with it. The molten glass is placed upon an iron table and pressed into a plate, several inches square and about a half inch thick. After it has been cooled gradually it is broken into small squares, or tesseræ, known as smalts.

Copies of an original painting are cut into sections. Squares of different colors are then fitted together to form specific portions of the picture and pasted, face down, to strong paper. In this form the mosaic comes to America. Sections of the walls to which it is to be applied are covered with a special kind of slow-drying cement. The numbered sections of mosaic are then put in place carefully, and pounded lightly until the edges are even and the surfaces level. They are then allowed to set. Subsequently the paper covering the face of the mosaic is soaked off and the decoration exposed.

LIGHTNING RODS PROTECT STRAW STACKS

For several years an Iowa farmer has protected his straw stacks with lightning rods in the same manner that he protects his farm buildings. The uprights on a stack are supported on a footboard which runs the full length of the stack, along the ridge. The rods are grounded through gas pipes, the lower ends of which are buried deep in the earth. This apparatus is used from year to year. When a stack is to be removed the cable and rods are rolled up and put aside until a new stack has been built. The device can be quickly and easily installed. Though 12 trees on this farm and three barns on neighboring farms have been struck by lightning in recent years, the barns and stacks on this farm have so far enjoyed complete immunity from damage by lightning.



An Iowa Farmer Installs a Set of Removable Lightning Rods on His Straw Stacks Every Year

STANDARDIZING A NATION'S PRODUCTS

By J. CROSBY McCARTHY

BY providing better tools with which to work—tools in the form of standards—the national Bureau of Standards, at Washington, is promoting the welfare of the government and is advancing science and industry. It is rendering a service so wide in its scope as to have a more or less direct bearing on almost every line of endeavor, a service that is becoming better understood and more appreciated by men of science and industry alike. Organized on a foundation sufficiently broad to enable it to keep pace with ever-increasing demands, it has grown into one of the most important and valuable government bureaus, dealing, as it does, with problems which have a direct relation to the very prosperity of the country.

The Bureau of Standards is something more than a mere repository for standards of weight and length and for data regarding values of physical and technical constants and mechanical performance; it is a great national physical laboratory, including such branches of chemistry and engineering as are necessary to accomplish standardization in the broad modern sense. It makes research into things as yet unknown and puts things discovered and determined at the service of the people. The bureau deals with standards of measurement, standards of quality, standards of value of constants, and standards of mechanical performance, but this enumeration does not convey an adequate conception of its many activities. There have been added to the list standards of practice where uniformity is needed in scientific and technical matters involved in the enactment of laws, regulations, technical codes, and the like.

The Bureau of Standards confines its activities as far as possible to matters in which an authoritative value or national uniformity is required. It does not enter fields that can be covered effectively by private laboratories. It seeks neither to compete with nor replace such institutions; on the contrary, it coöperates with them and aids in making the service which they render more accurate and effective.

The bureau is not a money-making institution, for the fees charged for work done are for the most part nominal. No charges are made in the case of tests made for government and state institutions. Anyone may have tests made at the bureau upon furnishing articles to be tested in the form specified and the payment of the scheduled fee.

Some idea of the far-reaching work of the institution may be obtained from an examination of a typical day's mail received at the bureau, which may contain letters from such as iron founders, pipe makers, tanners, makers of optical instruments, textile engineers, well sinkers, photographers, universities, meat packers, concrete contractors, lamp makers, boiler makers, officials of international commissions, engineering firms, dry-goods houses, college professors, students, manufacturers of refrigerators, oleomargarine, watches, and of gas meters, paper manufacturers, public-utility commissions, municipalities, and officials of foreign governments. A morning's mail at the bureau recently contained letters from 85 different professions, institutions, firms, and organizations.

The movement for standards in this country dates back to the early years of the nation when there was obtained from a London instrument maker a standard of length for use by the coast survey and a copy of the British troy pound for use in the coinage of money, and from which the avoirdupois pound was derived. Today the national Bureau of Standards is housed in a group of buildings that stands on one of the many wooded hills fringing the national capital. Its buildings stand in the center of a tract well out from the business center of the city, in order to insure freedom from mechanical, elec-

trical, and other disturbances. Sixteen acres are included in the grounds of the institution. There are four main buildings, 200 ft. in length and about 60 ft. in width, four stories high. A fifth building, one to be devoted exclusively to chemical laboratories, now is in the course of construction. Four smaller buildings for special work are included in the group. The bureau also operates a mechanical testing plant at Pittsburgh, Pa., in temporary quarters, and a cement and clay-products testing plant at Northampton, Pa.

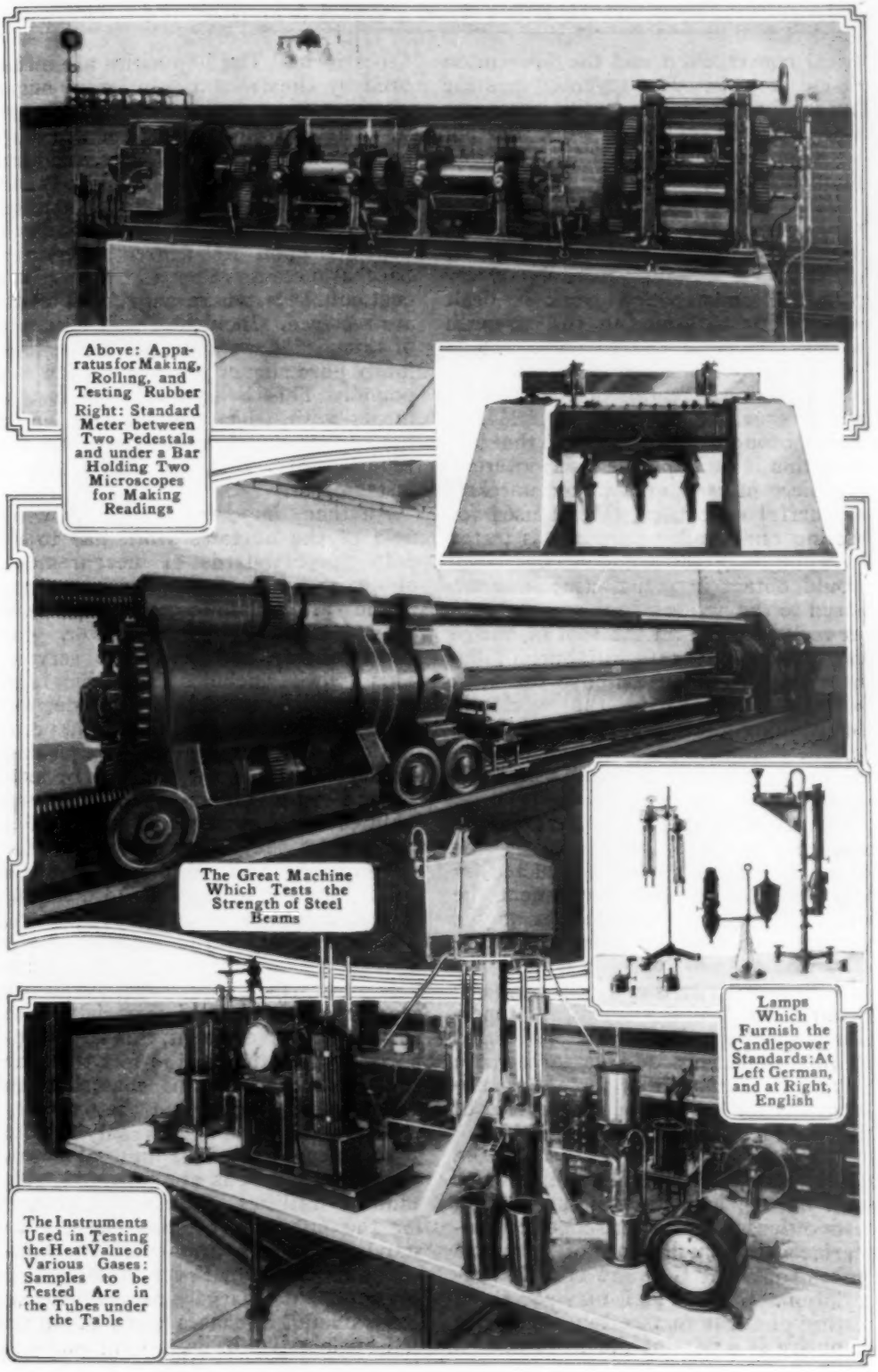
Within the buildings of the Bureau of Standards is to be found a perfect wonderland of science. The institution has been called "the home of precision where the yardsticks and cupfuls of science and industry are refined"; it is here that one may have ocular demonstration that truth oftentimes is stranger than fiction. A liquid-air machine in one building provides extremely low temperatures for one kind of testing; in another building heat is generated of such intensity that rocks and the hardest of metals are melted like snow. Thermometers in the bureau's equipment permit readings as high as 1,000° Fahrenheit and higher, and as low as 300° below zero Fahrenheit. With one instrument the amount of heat given off by any selected star may be ascertained; with another, temperature changes of less than a millionth part of a degree Fahrenheit are recorded. Balances capable of measuring to 1/50,000,000 part of an ounce are in one room; in another section of the bureau is a machine capable of measuring a load of thousands of tons.

The equipment of the bureau includes almost every conceivable kind of testing apparatus, and should a problem necessitating the use of some new device be presented, there is a fully stocked machine shop and a force of skilled instrument makers at hand to construct it. The testing of water-current meters for the Geological Survey, the Reclamation Service, and other branches of the government presented just such a problem; there was no body of water available in which to make such tests. All difficulties were overcome by constructing a concrete tank several hundred feet in length in the grounds of the bureau. In these tests the tables are reversed; the water remains still and the meter moves through it.

The Bureau of Standards does not lose sight of practicability in its testing work. Precision is demanded in all its work, but not undue precision, for the bureau aims to assign to each case the degree of precision which it deserves. Ten minutes may be spent in testing a clinical thermometer which is perhaps correct to a tenth of a degree. On the other hand, weeks may be spent in determining a standard of length for some manufacturing plant where measuring instruments are made. The preparation, verification, and distribution to the governments of the world of the modern metric standards of length and mass took no less than 15 years.

To no industry is the service rendered by the Bureau of Standards of greater value than that dealing with things electrical, which has, perhaps more than any other industry, adopted scientific methods and precision measurements. The bureau's equipment for the testing of electrical apparatus is complete in every detail. Instruments for testing voltmeters and other electrical measuring devices have been refined to such an extent that maximum accuracy and minimum labor are combined. In one room may be found hundreds of electric lights undergoing a life test in different positions and under different current conditions; in another room the candlepower of such lights is ascertained, and in still another section are the lamps which represent the candlepower standards of the country.

An important work of the bureau in the electrical field has been investigation of the electrolytic effects of stray electrical currents upon underground pipes and other metal construction, with a view of determining some of the data necessary in standardizing elec-



Above: Apparatus for Making, Rolling, and Testing Rubber
Right: Standard Meter between Two Pedestals and under a Bar Holding Two Microscopes for Making Readings

The Great Machine Which Tests the Strength of Steel Beams

Lamps Which Furnish the Candlepower Standards: At Left German, and at Right, English

The Instruments Used in Testing the Heat Value of Various Gases: Samples to be Tested Are in the Tubes under the Table

trical construction and the prevention of electrolysis. For several years the bureau has coöperated with the army and navy in research work dealing with various problems of radio communication.

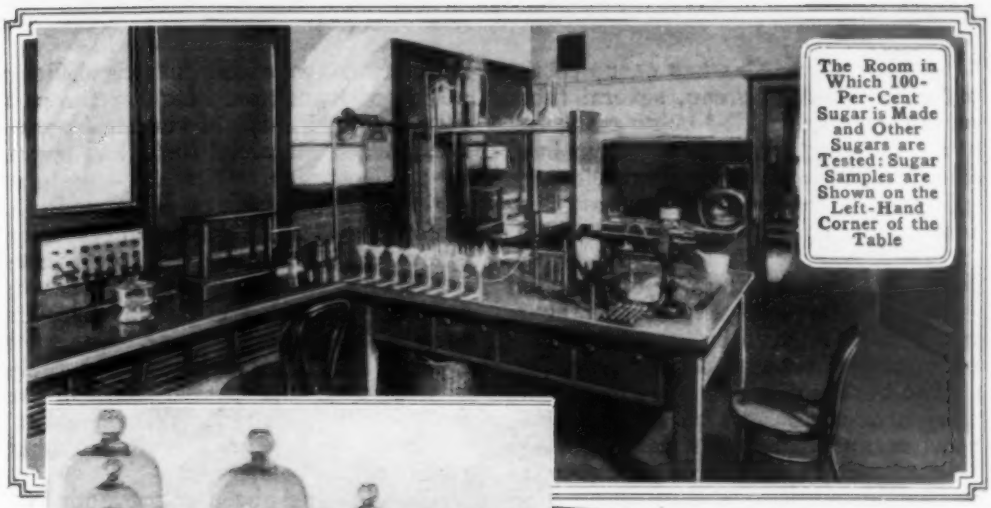
The testing and standardization of structural steel, concrete, and other building materials constitutes another great work of the bureau. Every phase of construction work is dealt with. For determining the strength of steel girders, and like material, a giant testing machine capable of exerting a pulling strength of 1,150,000 lb. and a crushing strength of 2,300,000 lb. is brought into use. To the layman this is perhaps the most interesting piece of apparatus in the bureau's wonderful collection. Metal used for roofing and similar purposes is tested by subjecting it to conditions which would obtain in actual use; it is exposed to the action of the sun and rain on racks erected on the roof of one of the buildings. At its Pittsburgh laboratories the bureau employs the most powerful machine in the world in determining the strength of steel and masonry columns; it is the Olsen testing machine which can exert a pressure of 10,000,000 pounds.

Of great value to the government, science, and the industries, is the chemical research work conducted by the bureau. For the government the bureau handles such problems as the analysis of inks, lubricating and other oils, paints and varnishes, and researches on writing and other papers; determination of the chemical properties of metals and other materials used in manufacturing, and research with regard to corrosion of metals constitute a small portion of the service of this kind rendered to the industries.

A wide field also is covered by the department of the bureau which deals with optics; its activities range from tests of lenses in the periscopes of submarines to examination of spectacle lenses to see if they are true to prescription. Strange as it may seem, the testing of sugar to ascertain its degree of purity is a part of the work of this department. The impurities are measured by the twist a solution of sugar gives to light waves passing through it. The instrument used for this purpose is called a saccharimeter, and from the governmental standpoint it is one of great importance, for the amount of duty imposed on sugar imports depends upon its degree of purity. Saccharimeters are used at the various customhouses where sugar shipments are received. Incidentally, the Bureau of Standards makes and sells absolutely pure sugar; price, about $18 per pound. This is used to test instruments with which the heat value of fuels is measured, as well as to fix the 100-per-cent point in sugar-testing instruments.

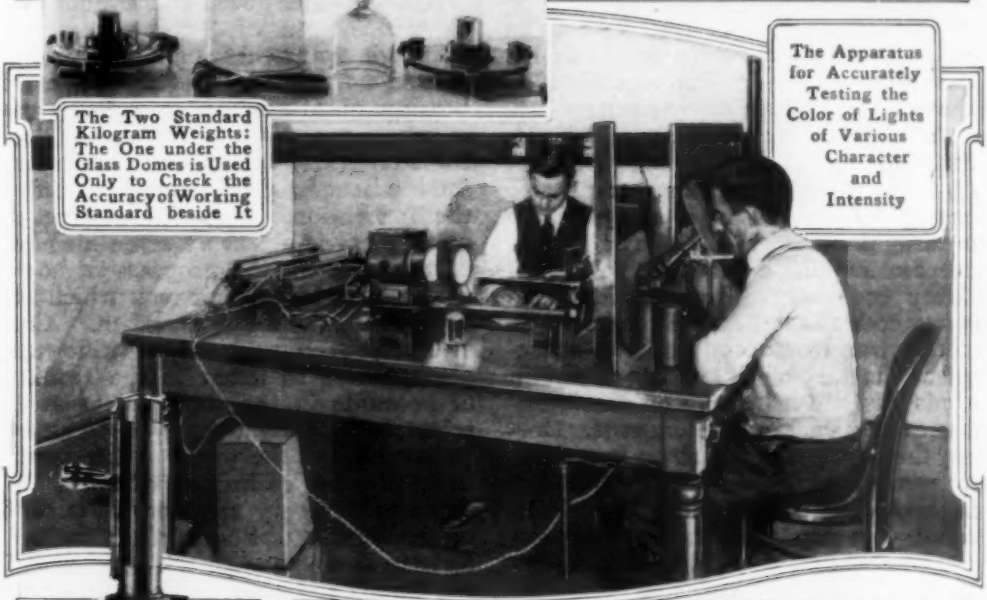
Another important and growing field of the bureau's work has to do with the standards of measurement, of quality, and of practice concerned in the various public utilities, particularly electric light and power, gas, street-railway and telephone service. This work includes scientific and engineering research in connection with public-utility questions, the preparation of specifications regarding quality of service, the methods of testing and inspection employed by municipalities and commissions, safety rules for use by the utility companies for safeguarding their employes and the public, and the collection and distribution of information on these matters.

Examination of the records of the Bureau of Standards for the past fiscal year shows that approximately 90 per cent of the testing of materials done was for the government, this large proportion being due to the fact that the commercial testing of materials to ascertain whether or not they comply with specifications is done only for the government, except in unusual cases, where the public is not provided with suitable facilities. The actual testing for the public is confined largely to standards of measurement. The testing of materials for Federal institutions has contributed largely toward placing government purchases on a scientific and businesslike basis.

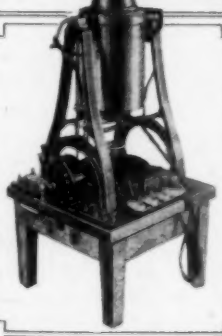


The Room in Which 100-Per-Cent Sugar is Made and Other Sugars are Tested: Sugar Samples are Shown on the Left-Hand Corner of the Table

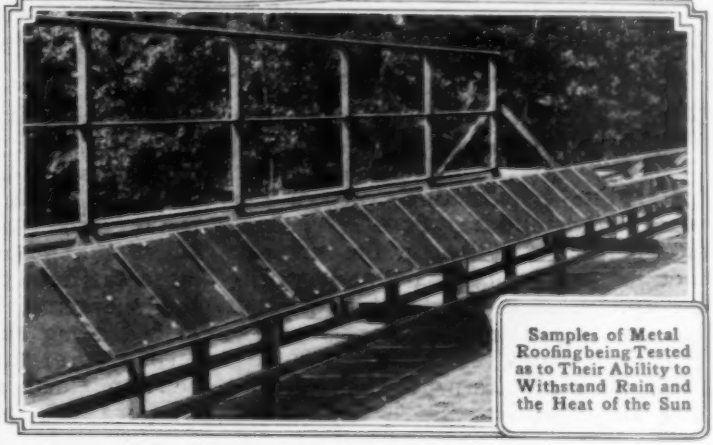
The Two Standard Kilogram Weights: The One under the Glass Domes is Used Only to Check the Accuracy of Working Standard beside It



The Apparatus for Accurately Testing the Color of Lights of Various Character and Intensity



The Standard Thermometer Comparator: With This Instrument Temperatures may be Measured to One One-Thousandth of a Degree



Samples of Metal Roofing being Tested as to Their Ability to Withstand Rain and the Heat of the Sun

Testing of textiles has occupied the attention of the bureau, several thousand tests of this kind being made last year. Many special investigations have been undertaken; for example, on the effect of cotton compression in baling upon the spinning qualities of the fiber. Bales now run 25 lb. to the cubic foot. If cotton can be further compressed without injury to the fiber, savings could be effected in bale covers, transportation, warehouse charges, etc.

The bureau also has investigated the subject of the cotton bunting which is now manufactured for making flags as a substitute for the more expensive wool bunting. The cotton bunting showed up well in the tests made, and as a result large quantities of this material now are being employed by the navy and other departments.

A study of the protection of buildings against lightning has been in progress recently, and the bureau also has been engaged in a study of life hazards in electrical practice and in the preparation of a national electrical safety code, as well as a national gas safety code along the same general lines.

The war in Europe and the subsequent shutting off of imports of certain kinds has had a bearing on the activities of the Bureau of Standards. During the past year researches have been in progress to supply information necessary for the manufacture in this country of goods which are no longer received from abroad. Manufacturers have been compelled to introduce new methods, to use new materials, and to develop new processes, and the bureau has striven to assist in this difficult period of transition. During the past year the production of chemical porcelain on a commercial basis has begun in this country. The clay-products division of the bureau at Pittsburgh, having worked out the subject fully, presented the results of its labors to manufacturers, and two concerns are now producing chemical porcelain ware of satisfactory quality. The same division also is working on the problem of producing optical glass of the best quality, which, like chemical porcelain, has never heretofore been made in this country.

There is one phase of the activities of the Bureau of Standards which, although somewhat unofficial in its nature, nevertheless has an important bearing on the value of the services which it renders. It consists of lectures on scientific and technical topics for the benefit of the scientific staff of the institution. One afternoon each week there is a talk by some member of the staff on the progress of some particularly interesting task which his department has undertaken. One afternoon each week the scientific staff also gathers to listen to the reading of accounts in the technical press of scientific investigations being carried on throughout the world which would be of interest to bureau workers. In this manner every member of the staff of the Bureau of Standards is enabled to keep in touch with the activities of the institution and to know what is being done by the scientific world in like fields of endeavor.

PORTABLE CANOPIES SHIELD WORKERS FROM SUN

Pipe-line construction through the marsh lands and bayous of Louisiana is usually undertaken in the summer months, because of unfavorable working conditions encountered in winter. During the hot season, however, the sun bakes down relentlessly and even the natives require protection from it. The accompanying illustrations show how suitable protection was provided in projecting a loop line between the Arkansas boundary and an oil-refinery station at Baton Rouge, La. Portable frameworks, supported several feet above the ground and covered with large tarpaulins, were used to shade the workers. These devices were moved along as a line was projected section by section, the men remaining beneath them as much as possible. The method used in laying a pipe

Working beneath One of the Shelters in the Sweltering Sun

Carrying a Shelter across a River to a Point Where the Workers are Concentrated

across shallow streams and bayous in this section is also interesting. Instead of constructing it on a pontoon structure and then sinking it into position, it is built out across the water on temporary supports with the aid of a portable windlass. As frequently it is built with the assistance of merely a windlass, only the open end of the pipe being kept above the water.

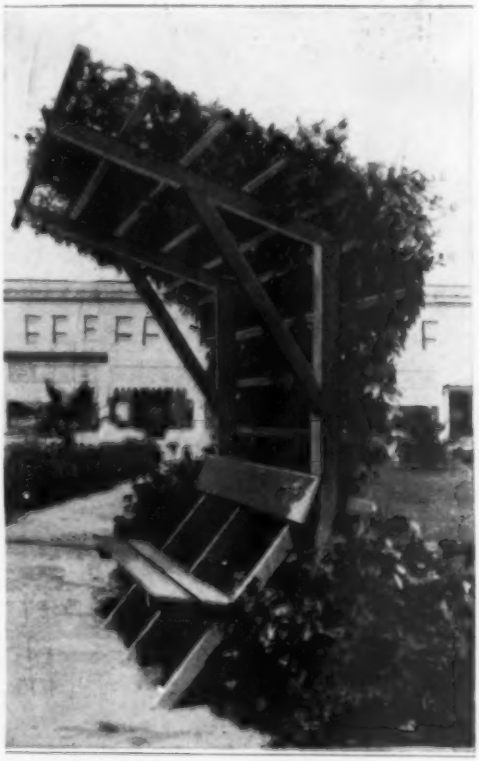
CHECKER GAMES ARE PLAYED NIGHTLY BY WIRELESS

Members of the Watertown, N. Y., Radio Association who are checker enthusiasts are indulging in nightly long-distance games. This odd diversion has a number of devotees and plans are now being made for a general tournament in which the entire personnel of the organization will participate. In playing checkers by wireless, two boards, instead of only one, are used. The squares on these are numbered, while each set of men is lettered. By this system the various moves are easily designated and the game pursued without delays. Three hours were consumed in playing the first contest some time ago. Now, however, it requires only a little more time to play off a wireless game than one contested in the usual way.

¶ According to standards recently set by the Department of Agriculture, food labeled as "diabetic" must not contain more than half the amount of starches and sugars contained in normal food of the same class.

VINE-CANOPIED BENCH IS PLEASING PARK FEATURE

A bench for the resting of a tired passer-by, shaded by an arbor of simple construction, is a feature of a small park in a western city. The arbor has but one side, a design which permits its easy installation along a walk or shady path. Chicken netting nailed over the



This Vine-Shaded Seat Makes a Pleasing Resting Place along a Park Pathway

framework forms a foundation upon which honeysuckle vines may grow thickly. Though inexpensive, the bench and its canopylike top make a convenience much appreciated by park visitors.

PAPER-HANGING MACHINE DOES WORK OF THREE MEN

A paper-hanging machine that enables a man to put on three times as much wall paper in a day as he can by hand has been invented by a New Jersey man. The machine is of aluminum and contains a roller with an adjustable cutting knife which trims the paper to the desired width; a roller that applies paste to the paper, and other rollers that guide and hold the material as it is being placed on the wall. The pattern is matched at the baseboard, after which the machine is pressed upward along the wall, laying the paper as it goes. When the ceiling, or border, is reached a shearing device within cuts the paper off at the right length. Paste is applied only as fast as the paper unrolls. The machine may be used on ceilings as well as walls.

HAT THROWN INTO STREAM LOCATES DROWNED MEN

As a means of locating the bodies of four United States soldiers who were accidentally drowned in the Rio Grande recently an unusual experiment was tried and proved successful. A hat was thrown into the water at the point where the men had last been seen and was followed downstream until, after traveling about five miles from the scene of the accident, it came to an eddy where it moved about slowly for some time. This gave the searchers what they thought might be a clue and, following a practice frequently used in searching for bodies, a charge of dynamite was exploded at the point where the progress of the hat had ceased. Immediately the bodies came to the surface. The explanation of the experiment is that the Rio Grande in this region is tortuous and has many eddies. The searchers rightly assumed that the bodies would be carried downstream until they came to an eddy, which in this instance was indicated by the retarded progress of the hat.

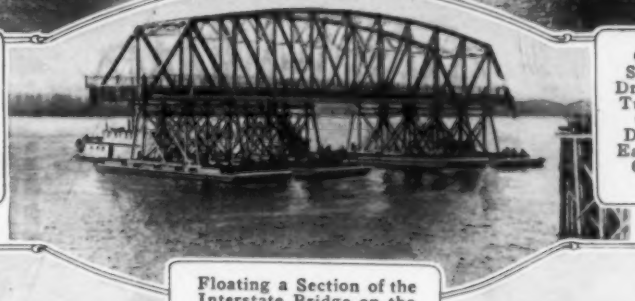
ANTISEPTIC MOUTHPIECE FOR TELEPHONES

To guard against multitudes of germs such as have been found by microscopic examination of telephone mouthpieces, there has been devised an antiseptic mouthpiece which consists of three shells, one within the other. The inner one is similar in shape to the ordinary telephone mouthpiece. It is perforated and is fastened to the transmitter by threads. An annular flange, or rim, at its outer end holds the other shells in place, as shown. Between the outer and inner shells is a third shell, also perforated. Disinfectant between the outer and middle shells purifies the mouthpiece by the fumes given off, which pass out through the apertures. Microscopic examination of the new device, after use by many persons, showed an absence of infection.

SPANS OF LONG BRIDGE FLOATED INTO PLACE

Bridge Spans Which have been Floated into Position: The Supporting Barges Are Still under the Third Span

One of the Spans, being Drawn by Two Tugs, Leaving the Special Docks Where Each Span was Constructed



Floating a Section of the Interstate Bridge on the Columbia River

The Trestlework Supporting the Spans Was Just High Enough to Allow Them to Slip into Position Easily

One of the Steel Sections, Weighing More Than 400 Tons, Almost in Its Final Position in the Bridge

The interstate bridge which is being built over the Columbia River to connect Washington and Oregon will consist, when completed, of 13 steel spans, 12 of which were assembled on docks especially made for the purpose and then floated into their final position. One span weighs 468 tons. When a span has been completely assembled, four scows or barges are floated beneath it. These are partly submerged by means of 6-in. centrifugal pumps operated by gasoline engines. Heavy bents are then erected between the barges and the span, and strongly braced, whereupon the pumps are set to work emptying the scows. As these rise they lift the span from the dock. Two tugs attached to the scows convey the steel structure, assisted by a third tug, which helps to turn the other boats and their burden around so that the load may be pushed instead of pulled.

Near the piers the tugs are cut loose and 20 men with lines and capstans shift the span into place. When within half an inch of the final position, horizontally, jacks are put under the span, and it is lowered onto the piers.

STORM-CURTAIN OPENER IS CONVENIENCE FOR AUTOS

Getting in and out of an automobile covered with storm curtains in rainy weather is a task attended with difficulties. Water drips off the flapping protectors onto clothes, and much hunching down is necessary in order to

squeeze through the narrow opening usually provided. To eliminate these inconveniences a new type of storm curtain has been devised. It consists of a U-shaped bar of iron or other metal

New Storm Curtain for Automobile Use is Fastened on Brackets to the Door, Allowing Easy Entrance and Exit

which is supported in an inverted position by sockets on the doors of a car. The bar so erected serves as a frame to which the storm curtain may be attached. Opening the door then causes the storm curtain to open with it, leaving a broad opening through which one may enter or alight. When closed, the door curtains fit in snugly with the others on the car, making a storm-proof protection as with the ordinary kind of curtain.

"SAFETY FIRST" CAR SHOWS MOTION-PICTURE DRAMA

A dramatic, interest-gripping motion-picture drama is the channel through which the employes of the New York Central Railroad lines are being taught the vital lessons of the "safety first" movement. A railway coach, fitted up for the special purpose of showing this production, is being taken over the lines, stopping at all yards and shops for daily exhibitions before employes and their families. Employes are required to attend. Not only do these reels show the various practices in shops and switch yards which are now universally recognized as unsafe, but all of these practices are skillfully woven into a plot which contains all the thrills of fiction, including a head-end collision, and yet is recognized by railroad men as being tragically real. It will require many months for the car to cover the whole railroad system.

MANY YEARS REQUIRED TO BUILD STRANGE CLOCK

A mechanical clock which contains 298 moving characters carved from oak with a penknife and depicts at stated intervals scenes from biblical and American history, and others of special interest to a fraternal order, has been completed by a Pennsylvania jeweler after five and a half years of labor. The clock is of oak and is operated by electricity from a dynamo run by a small gasoline engine. It is 8 ft. high, 12 ft. wide, from 3 to 5 ft. thick, and weighs 1,600 lb. The clock is divided

This Mechanical Clock Required Five and One-Half Years to Build and Contains 298 Moving Figures, Carved from Oak with a Penknife

The Compact Electric Kitchen Range with Double Heat-Retaining Walls, Used in One of the "Electric" Bungalows

Glasgow Bungalows in Which Electricity Is the Only Fuel Used

A Living Room in One of the Glasgow Bungalows, Showing the Electric Grate Used

into three massive towers, the first of which is labeled "the apostolic clock" because it portrays successively many scenes from the New Testament, including the Lord's Supper, Peter denying the Savior, etc. The central and highest portion of the clock is devoted to national figures and events. Here, as if keeping step to the music that accompanies them, appear all the presidents, many Civil War generals of the North and South, Spanish War figures, and many others. The third tower is devoted to scenes portraying the benefits of a fraternal order. Following a death scene the order is honored by the bereaved ones, for kindnesses shown in their distress.

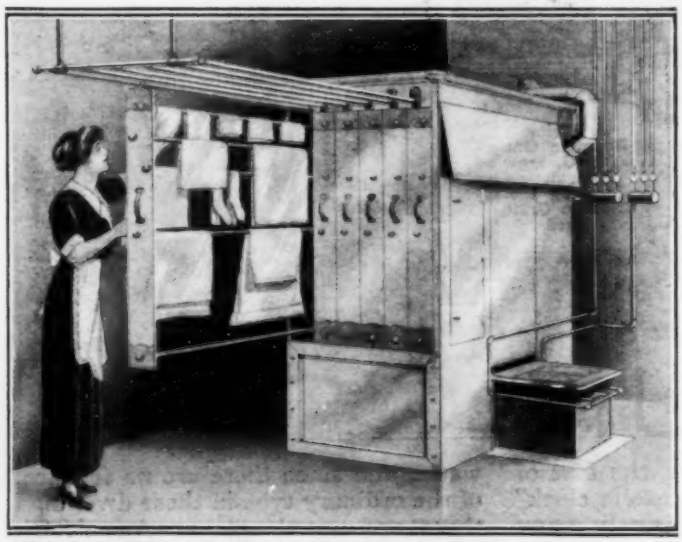
HOMES ENTIRELY EQUIPPED WITH ELECTRIC DEVICES

A small suburb composed of attractive, stucco-finished bungalows in which all the heating, cooking, lighting, and cleaning devices are operated by electricity, has been established near Glasgow, Scotland. Chimneys are characterized by the builders of these modern homes as a useless expense, symbols of dirt and mediums of waste, and since there are no furnaces of the ordinary type in these dwellings, there are no chimneys. An electric grate, 27 in. high, which takes 2.5 kw., is used instead of a drafty fireplace. A very compact electric range, with double heat-retaining walls, takes the place of a coal or gas cook stove. Water for the bathroom is heated by electricity close to delivery, thus saving loss in the use of long pipes. The cleaning of the floors, walls, curtains, and upholstery is done with a vacuum cleaner electrically driven. While admitting that there is a very material increase in the electric bill of the household using such equipment, it is claimed that the housework is made so much lighter that one or more maids can be spared. Added healthfulness of the home, due to absence of soot, dirt and drafts, is also claimed.

¶To pass safely under the electrically charged wire fences erected by the Germans on the Dutch frontier, the Belgians use wooden barrels in which they roll themselves under the "live" barriers without mishap, the iron hoops grounding the electrified wires.

LAUNDRY DRIER UTILIZES HEAT FROM GAS STOVE

A drying cabinet so connected with a gas laundry stove that the surplus heat from the latter heats the former is now being manufactured in sizes suitable for residences, apartments, and small institutions. It consists of a cabinet so joined to the gas stove that the heat passes through the drying chamber and quickly removes the moisture from the articles hung within.



This Drier Utilizes the Surplus Heat from the Gas Laundry Stove with Which It is Connected, and So Is Not Expensive to Operate

On racks which vary in number according to the size of the drier, the clothes or other articles to be dried are hung. These racks are so suspended on frames or tracks which project from the end of the drier that they may be easily withdrawn for the purpose of removing dried articles or hanging wet ones. The capacity of these driers ranges from 78 to 231 linear feet. It is claimed that the drier and laundry stove of family size can be operated at a cost of two to three and one-half cents per hour, where the cost of gas is $1 per 1,000 cubic feet.

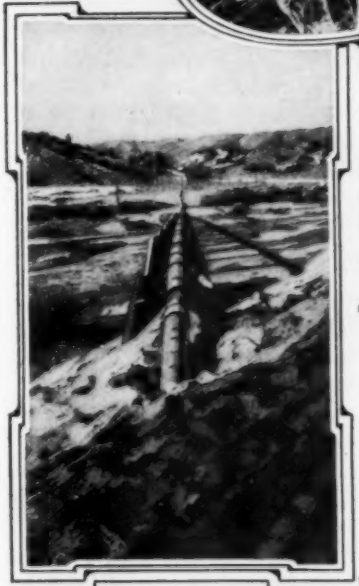
PIPE LINE BUILT ACROSS RUGGED COUNTRY

A 200-mile pipe line for carrying oil from the rich oil fields of the San Joaquin Valley to San Pedro, the seaport of Los Angeles, has recently been completed. The time required to construct the line was 15 months, a fast record considering the natural difficulties that confronted the builders. Both the main line, which is 152 miles long, and a branch, 54 miles long, are composed of 8-in. pipe. At Tejon Pass the line rises to an elevation of 4,222 ft., and at another point, 3,716 ft.; a tunnel was utilized in one instance to avoid too great an elevation. The line cost $3,500,000.

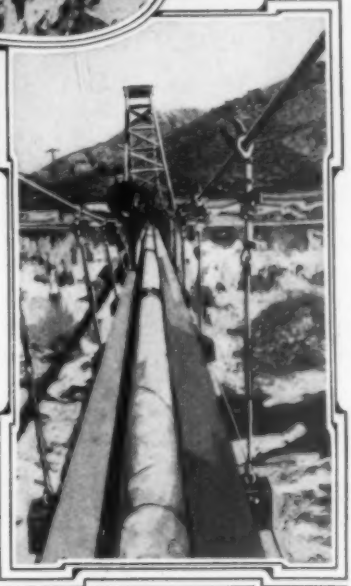
Along portions of the route the line follows highways and railways, utilizing existing bridges and culverts. In other sections trestles had to be constructed and also bridges, one suspension bridge being 500 ft. long. At several stream crossings a row of piles was driven and cut off below the gravel surface. The pipe was laid in a 4-ft. trench on the upstream side of the piles. It was then surrounded by a concrete casing, 22 in. square, and bolted to the piles by long stirrup bolts.

There are 16 pumping stations located from six to 21 miles apart along the line, according to the length and steepness of its inclines. Connected with each pumping station are heaters through which the oil is pumped, thereby increasing its fluidity. Eleven of the stations are capable of pumping about 1,000 barrels per hour at 800 lb. per square inch pressure. The other

A Team of 26 Mules and Horses Drawing a Boiler to the Site of One of the 16 Pumping Stations

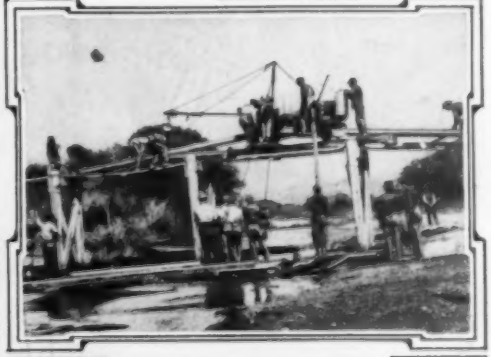


The Pipe Line Projecting from a Hillside and Extending across the Desert, Supported in Part by Framework



A Near View of the Pipe Line and a Suspension Bridge Which Carries It over a River Bed

A Suspension Bridge, 500 Feet Long, Built for the Pipe Line in a Region Where Bridges Are Few



A Pipe-Screwing Machine, Made from an Automobile Engine, Capable of Putting Together 6,000 Feet of Pipe Daily

stations are fitted for special duties, such as serving refineries, loading tanks, ships, etc. At least one 37,000-bbl. tank is installed at each station, which, when kept full, provides for 18 hours' operation of the pumps in case repairs are necessary farther up the line.

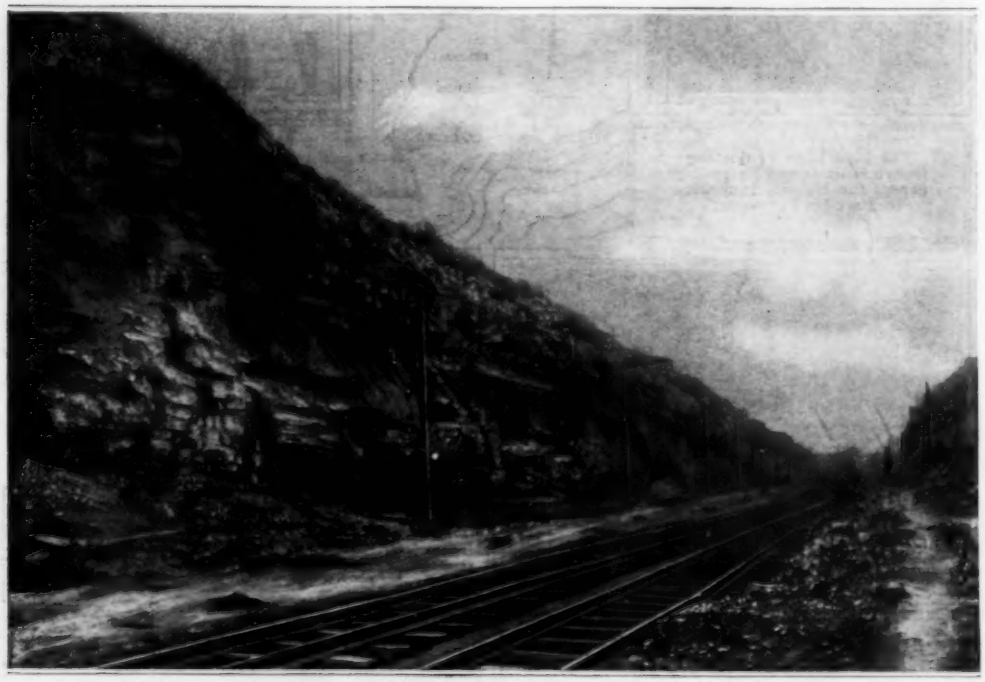
An ingenious pipe-screwing machine was developed by the contractors, consisting of a frame supporting a 40-hp., four-cylinder automobile engine which rotated a pipe-gripping chuck. The whole machine was mounted on rollers resting on the pipe along which it was moved by power and was capable of screwing daily an average of about 6,000 ft. of 8-in. pipe.

KANSAS CITY'S STREET CUT PROVES COSTLY

It cost Kansas City, Mo., $400,000 to dig what is called the Main Street cañon, 90 ft. wide and from 40 to 80 ft. deep, through three blocks of hills that the traffic from the new union station might have an outlet to the southern residence district of the city. Now slides of earth and boulders have occurred, and engineers have declared that the cut is unsafe for traffic. The street-railway company laid a double track through the cañon to shorten its trackage by four blocks, but the rails were knocked out of alinement by falling stones before they were used. The city administration asserts that it has no money with which to remedy the difficulty, and the owners of abutting property protest that they should not be made to pay for making the cañon safe.

PROTECTOR SHIELDS PEACH TREE AGAINST BORER

A Maryland fruit grower has patented a protector which shields peach trees from the insidious peach borer that occasions so much loss in peach orchards. Study of the habits of this insect shows that the parent moth lays



The New $400,000 Street Improvement in Kansas City Which Falling Boulders Made Unsafe for Traffic

This Tree-Encircling Mat, When Properly Fitted and Sealed to the Tree, is Said to Afford Practically Complete Protection against the Peach Borer

its eggs mainly on the tree trunk. The young borer enters the trunk by first crawling down between the soil and the tree where he finds moist, soft bark which he can penetrate easily. To prevent his crawling down, the protector is fastened about the tree just above the ground. It consists of a flexible, tree-encircling mat forming an impenetrable covering for the soil about the base of the trunk. A fringe next to the tree enables the mat to fit any size of trunk. An especially prepared viscous substance is used in sealing the seam where the mat overlaps and in closing the opening between the mat and the tree. Since the young borers are delicate they rarely enter the tough, weathered bark, and so perish when they encounter the protector.

TRAFFIC SQUAD USES CORK PLATFORMS IN WINTER

Traffic policemen of Cleveland are now provided with cork platforms on which to stand in the winter time. These consist of a frame about three inches deep filled with granulated pressed cork; a handle is fastened to one side by which it can be moved about easily. In the early years of traffic regulation it was found that the stone pavements became so hot in summer as to cause serious discomfort for the officers who were compelled to stand for several hours in sun-heated areas. Consequently wooden-block paving was laid in these small areas. The cork platforms are a more recent addition, for winter, and enable an officer to keep his feet out of the snow and slush. Formerly traffic was regulated by a whistle and movements of the arms; now semaphores, each with an iron base, ¾-in. pipe standard, and revolvable enamel sign are being introduced.

Traffic Policemen in Cleveland Stand on Cork Platforms to Keep Their Feet Out of the Snow and Wet. The Semaphore is Supplanting the Whistle Signal

HUMAN EYE ACCOUNTS FOR VANISHING GHOSTS

WHAT is without doubt a sound explanation of certain nocturnal apparitions has been advanced by a German scientist who attributes the responsibility for this phenomenon to the peculiar functions of the eye.

Many persons far removed from superstitious influences have encountered phantom images in the dark. They have awakened in the middle of the night and been startled by the presence of a dim, glowing light at one side of a room. And when they have turned their vision directly toward it in an attempt to determine its source, it has mysteriously vanished, only to reappear weirdly in another spot an instant later. The presence of an unpleasant something is undeniable, yet to tell what it is and to determine its exact location may at the moment be impossible. When such an incident is experienced by one who is only half awake and possessed with a healthy imagination, it is not to be wondered that a sense of fright and bewilderment often creeps into his mind.

Millions of very minute fibers which are branches of the optic nerve constitute the retina of the eye. At the end of each of these tiny members is an organ which converts light into nerve excitation. This organ appears in two forms, one known as a cone and the other as a rod, each different in both structure and purpose. It has been found that the so-called cones are active only in strong light, as during the daytime, while the rods are brought into service at night when there is scant illumination. Thus the functions of the two organisms are opposed so that one rests while the other works. At the point on the retina where an image is focused the sharpest, a depression employed when one centers his vision upon an object to get the clearest possible view of it, only cones are provided. Since these function only in strong light this part of the retina is sightless at night, which explains the reason that the shapes of objects seen in darkness are not well defined nor distinct. Outside of this focus spot, however, the cones and rods are both distributed over the retina.

Although the cones convey color impressions to us, the rods do not. The latter are literally color-blind and are able to transmit only white, gray, and black. That is why reds appear black to us at night and certain blues and greens seem to be whitish in color, or "rod white," as it is termed; an indistinct, silverish light similar to that of the stars visible on a dark night. Thus it will be understood that, when in an unilluminated room, we are entirely dependent upon the color-blind rods of the retina for sight, and that the sharp focusing point, or central depression, of the latter is off duty.

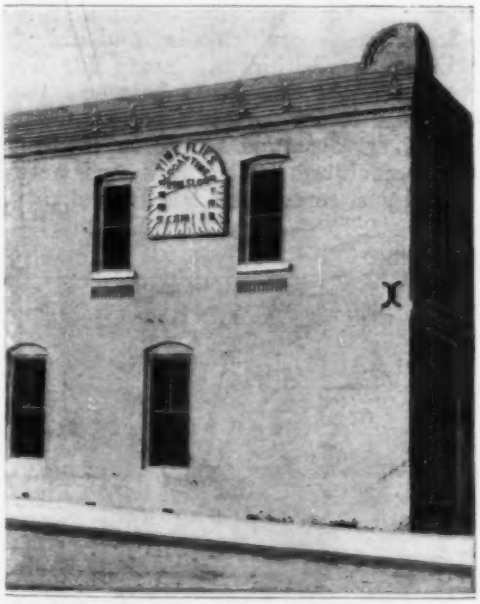
And here lies the reason that people frequently imagine that ghosts have hovered over them in the darkness, or danced about them in a lonely graveyard at midnight. Suppose, for example, that a pale shaft of light were reflected from some invisible source upon any object in a room, very dimly illuminating a sufficiently small area so that the image of it would barely cover the focus point of the retina. The rays from this, it should be assumed, would not be strong enough to affect the cones, but would excite the rods. Thus if one's vision were directed at one side or another of the light spot, the rays would hit that part of the retina provided with rods. The illuminated image would then be visible. Upon seeing an unnatural glow in a room after being roused from slumber it would be but natural for an observer to attempt to scrutinize it carefully. In other words he would attempt to focus his eyes upon the pale surface. The image in turn would move over the retina. The instant that it covered the rodless spot it would vanish from view, for the cones would be unaffected by it. Realizing that "the thing" had mysteriously disappeared, the observer might shift his glance slightly, and there would be the ghostly spot glaring at him as before. Again it would

melt into nothingness and hide in the folds of darkness at the least provocation.

This explains one of the much hooted-at, feared, and talked-of apparitions. It is one that might readily serve as a glowing, beckoning finger, as an "evil eye," or an evasive will-o'-the-wisp. And it is accounted for by the limitations, or peculiarities, of the human eye.

MANY DEPEND UPON SUNDIAL AT MIAMI STREET CORNER

On the south wall of a business building at one of the street intersections in Miami, Fla., there is a large vertical sundial. This has been in use for some time and serves passers-by and the "corner folk" as a town clock. Like any similar indicator, which has been properly made for the latitude in which it is employed, it is a dependable timepiece so long as the sun shines. While its appearance is commonplace to those who reside in sunny regions where such instruments are much used, this sundial rarely fails, because of its position, to attract the attention of the winter tourists from northern cities.



The Sundial Occupies a Conspicuous Position Where It may be Used by Hundreds of Passers-By

NEW SERVING TABLE MADE FOR QUICK-LUNCH ROOM

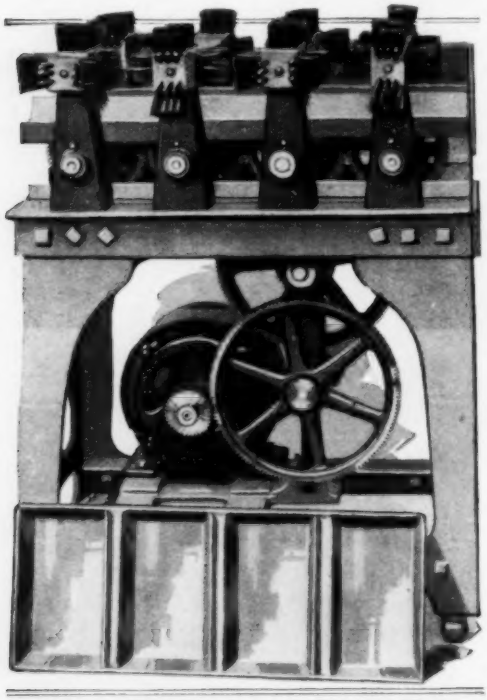
For use in quick-lunch restaurants, a combination individual table and chair has been designed which is intended to replace the more or less awkward arm-chair now commonly in use. It occupies practically no more room than the ordinary type of chair used in such places, and is quite neat and comfortable. A revolving stool is provided so that no difficulty is experienced in seating oneself. The lower part of the article is finished in white enamel, which permits it to be kept in a clean, inviting condition with minimum labor, while the table is fitted with a white top made of a composition material.

Instead of a Chair, a Revolving Stool is Used Which Enables a Person to Seat Himself Easily

MACHINE CLEANS AND GREASES BREAD PANS

Using a machine recently brought out, bakers are enabled to grease 2,000 pans with a very small quantity of lard. The object is accomplished through the aid of a set of soft brushes revolved at a speed of 70 or 80 revolutions per minute by an electric motor and intermediate gearing. Projecting

from the same wooden blocks in which the soft brushes are mounted is a set of stiffer variety. These are provided that all pans may be thoroughly



By Using a New Cleaning and Greasing Machine, Bakers are Enabled to Grease 2,000 Bread Pans with Great Saving in Lard

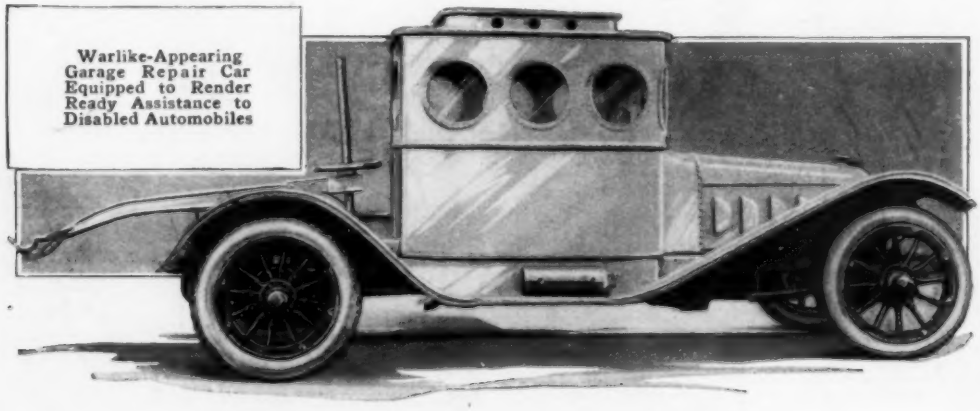
cleaned out before greasing. Otherwise burned crumbs from a previous baking often cling to the tins and make unsightly black specks in loaves turned out later. The machine finds extended use among bakers.

RECONSTRUCTION IN FRANCE TO BE AIDED BY EXHIBIT

An exposition is to be held in Paris during May, June, and July of this year for the purpose of displaying methods and materials for the reconstruction of houses, factories, farms, highways, villages, etc. Regions devastated by the war, either as means of defense or through assault, will be particularly concerned in this event. The United States apparently is the sole foreign country admitted to participation. The exhibit will be under the patronage of the president of France, leading engineers, hygienists, and business men.

CAR SPECIALLY EQUIPPED TO AID OTHER MOTORS

A powerful service car which has a distinctly warlike appearance, but which is designed solely to render assistance to disabled motor cars, has recently been added to the equipment of a Utica, N. Y., garage. It is made from a remodeled chassis of a well-known make, surmounted by a box-like body of sheet iron, in the sides of which are several circular and oblong windows. Within are seats for five persons. At the rear, between two mounted tool boxes, is a powerful lifting lever, designed to aid in righting other machines, etc. The lever is actuated by a screw and handwheel, and

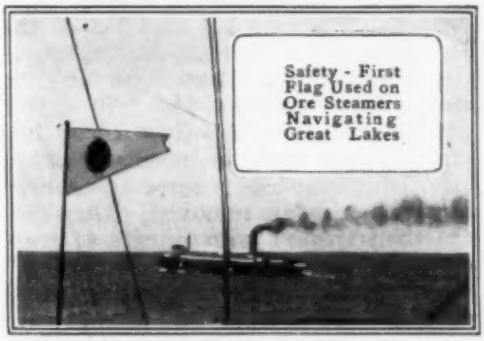


Warlike-Appearing Garage Repair Car Equipped to Render Ready Assistance to Disabled Automobiles

has a vertical range of 3½ ft. The car measures about 20 feet over all. It carries spare tires and gas lamps.

SAFETY-FIRST PLAN WORKED ON LAKE STEAMERS

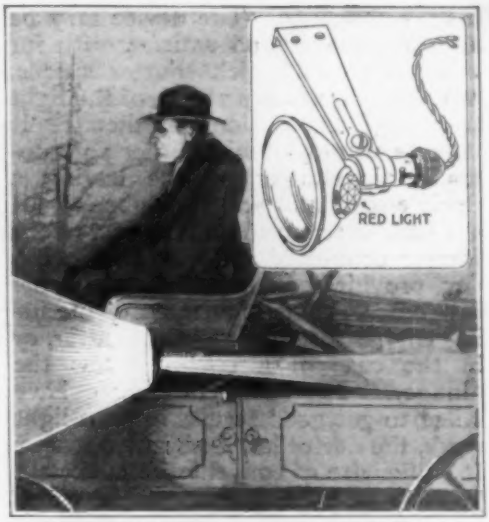
One of the steamship companies operating a large fleet of ore vessels on the Great Lakes has inaugurated a rather novel safety-first movement among its seamen. All of its steamers are provided with two white pennants, each having a red spot in the middle, which are carried at the bow and stern. One of these belongs to the deck hands and the other to the engine crew. When afloat they indicate that no member of either personnel has been disabled during the current shipping



season. In case of an accident incapacitating one of the men, the pennant representing his division of the ship's crew must be lowered for the remainder of the year. If the flags are flown throughout the season, bonuses are paid to the first mate and assistant engineer, who have charge of the welfare of the men.

ELECTRIC LAMP FOR WAGON OR CARRIAGE

An electric lamp especially designed to be attached to a carriage or wagon is now on the market. An adjustable iron bracket, which may be screwed to the body of the vehicle, holds the lamp in place. The reflector is of polished nickelplated brass. In it is set a tungsten bulb accurately focused. In the

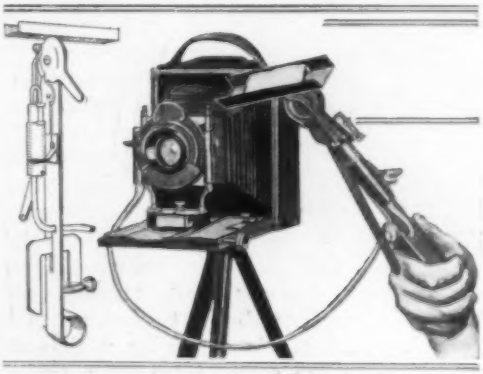


This Electric Lamp can be Attached Quickly to Any Carriage or Wagon

side of the reflector is a red lens with many facets which sheds light to the side and rear. The light may be turned on or off by means of a bayonet switch at the back of the lamp. The plug part of the switch can be left in the socket or removed, as desired. Insulated wires connect with the batteries located under the seat, or in some other convenient place.

FLASH-LIGHT GUN OPERATES CAMERA SHUTTER

To facilitate night photography, a flash-light gun has been developed which actuates the shutter of a camera simultaneously with the discharge of

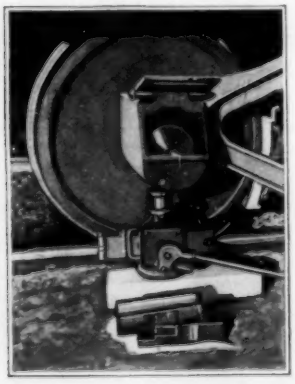


The Shutter is Actuated Simultaneously with the Flash by Pulling the Trigger

a flash cartridge. The device may be adjusted to respond satisfactorily for both slow and quick shutter speeds, enabling all, or only a part, of the light to be used as occasion may dictate. It may be employed with either an automatic air shutter or one having a flexible-cord release. If a tube is used the bulb is removed and the end of the former connected with a small cylinder provided on the handle of the instrument. The movement of the firing trigger forces air to the shutter, or in the case of a cable presses the plunger. For amateurs who have failed to get good results in flash-light work, the device has desirable features. It is likewise of convenience in certain respects to the press photographer who frequently works under extreme disadvantages. The fact that both the flash and the shutter are operated with one hand, leaving the other entirely free to hold the camera, often means much when fast work has to be done.

LOCK FOR CAR WHEEL USED IN REMOVING BRASSES

To facilitate the work of removing the brasses from the bearings of a car wheel when a train is on the road, a simple locking device has been invented which will hold a wheel to a rail while a car is being jacked up. The apparatus may be adjusted in less than a half minute and when once in place grips a wheel and rail tenaciously. While the lock is attached a wheel cannot be raised, turned, or moved, even though the brakes are released. The quickness with which it may be applied saves time for a train crew and thus lessens delays. It is claimed that one man can place the lock in position, jack up a loaded car, and remove the brasses in five minutes or less. Usually a number of men work much longer to accomplish the same thing. The device is made of cast steel and weighs 16 lb. It has lately been introduced in some of the yards at Seattle, where it is said to have proved serviceable. It is made in two sizes, one for the wheels of freight cars and the other for those of passenger and refrigerator cars.



FUR FROM MANY LANDS USED IN MAKING FELT HATS

A newly installed exhibit in the National Museum at Washington tells, by means of samples and other displays, how felt hats are made. It is not commonly known that fur of the North American beaver, South American nutria, Saxony hare, and English and Scotch cony are used in better grades of hats. Pelts from these animals are washed in whale-oil soap, after which the long, coarse hair, which cannot be used, is removed. The skins are then treated with nitrate of mercury, a process called "carroting," which gives the fur its felting properties when hot water and pressure are applied. Cutting machines are employed to shave off the fur close to the skin. From these the fur, without the skins, is carried on an endless belt, on which it lies apparently intact as if the skin were still beneath it. While passing along on this belt it is sorted according to quality and color by skilled workers, after which it is seasoned. Some manufacturers have from one to two million dollars' worth of fur seasoning in storage. After being seasoned the fur is thoroughly mixed mechanically. By a pneumatic device it is then collected on the surface of a sievelike cone in a fine, thin layer and immersed in boiling water, thereby developing the felting properties of the fur, the particles matting and locking together. These cones of felt, measuring 3 ft. high, are the rough forms which are finally transformed

into hats of various styles. Shrinking and shaping by baths, stretching, and blocking are among the final steps in the transformation.

MACHINE TESTS QUALITY OF AUTOMOBILE TIRES

A machine, set up in a garage window, and propelled by an electric motor, attracted considerable attention in a western city recently as a tester of rubber tires. The method of test consisted in subjecting a sample strip of rubber to the wearing effects of continued expansions and contractions. One end of the strip was affixed to a stationary support and the other oscillated back and forth under the motions of a long lever working on a cam within the machine. In this fashion the machine at one test stretched the rubber of a used tire over one-third of its length upward of 15 times per minute for several weeks in succession, the material showing little deterioration under this most severe treatment.

A set of pulleys and belts reduced the fast speed of the motor to a rate

Machine Erected in Show Window Stretches the Rubber of an Automobile Tire 15 Times per Minute for Weeks at a Time in Durability Test

satisfactory for the cam. A feature of this reducing gearing was the use of a fully equipped automobile wheel as one of the revolving members.

STEEL SHUTTER AND SCREEN FOR RESIDENCE WINDOW

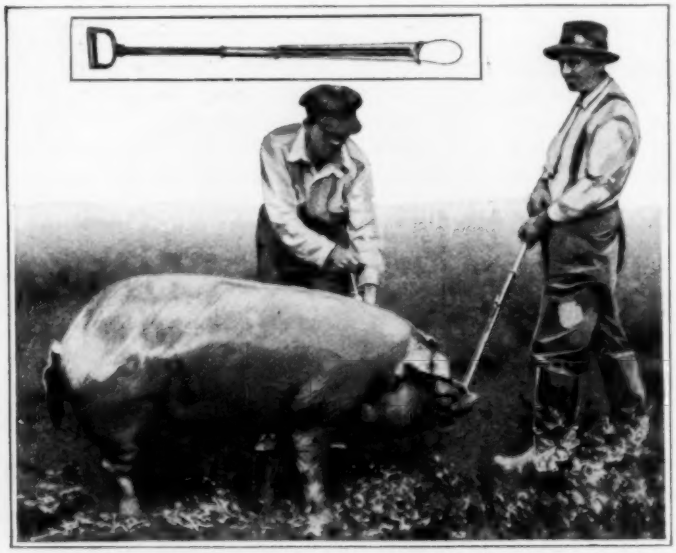
To replace both awnings and ordinary wooden shutters as protective mediums for the windows of a resi-

When Not in Use the Metal Shutter Is Out of View

dence, a combination steel shutter and screen is being introduced which has a number of pleasing features. The device is made entirely of metal, is very neat, and is not difficult to install. It is made with a metal frame which is hinged in place the same as a casement window, permitting ready access from the outside when it is wished to wash the glass. The screen is attached to the inner side of this, immediately back of the shutter, which is controlled by cords extending down the interior face of the window frame. By using these and a neat locking device, the shutter may be raised to any height and the slats firmly secured. When it is not wished to use it, the shutter is dropped from sight. The advantages of a shuttered window are found in the security and privacy it gives, in its ability to shade a room from intense rays of the sun, and also in the fact that a room may be ventilated during a storm without danger of rain being driven into it.

DEVICE FOR HOLDING HOGS WHILE RINGING THEM

A device for catching and holding hogs when it is desired to ring them, cut off their tusks, or immunize them from disease, consists of a steel bar, less than three feet long, on which slides a sleeve that carries a thumb release. The release engages a ratchet on the rod, and in this way the sleeve may be fixed firmly in any position desired. An annealed wire, the ends of which are fastened to the sleeve, extends along the rod from the sleeve to the lower end, where it passes through two eyelets, forming a loop at the end of the rod. After placing this loop around the snout, or upper jaw, of a hog it can be drawn up tightly by moving the sleeve. A handle at the upper end of the device gives the user a firm hold so that he can fully control the animal.



By Placing the Loop over a Hog's Snout and Drawing It Up Tightly the Animal can be Kept under Perfect Control

MONOGRAMS ON RADIATOR CAPS IS NEW PRACTICE

A fad of late origin among automobile users consists in the mounting of a monogram on the radiator cap at the front of the machine. In this position the owner's initials make a neat ornament, as well as serving to identify his machine from a number of others in case of question. Fraternal emblems, mimic policemen, club insignia, and numerous other figures have at one time or another been affixed to the radiator cap, but the use of a monogram is said to be the latest practice.

REAL PRISON LIFE SHOWN IN EXHIBITS AND FILMS

A prison exhibit, said to be the first of its kind in this country, has been held this spring in various cities in New York for the purpose of giving the people a clear idea of their state's prison system and methods. Perhaps the most unusual feature of this exhibit is the three sets of films shown. These portray actual conditions and are photographs of real prisoners. One of the sets of reels tells the story of the week which former Warden Thomas Mott Osborn of Sing Sing spent living the life of a prisoner at Auburn. The insanitary and antiquated surroundings which are cited as reasons for the demolition of Sing Sing are shown in another series. As a "happy ending," life in Great Meadow prison, where inmates have a thousand acres in which to work and recuperate physically and mentally, is shown in the third of the series.

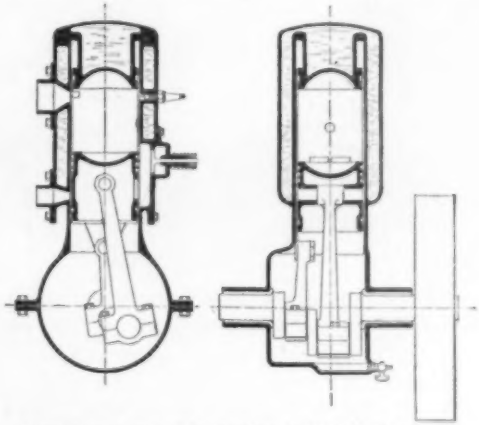
Sikh Warriors Carry a Ringlike Weapon on Their Heads. In Battle This is Thrown with Terrible Force, the Razor Edge Cutting Deeply

RING IS MURDEROUS WEAPON AT SHORT RANGE

A weapon, new to the armies of Europe, is the "chakkar" of the Sikh warriors from India who are fighting with the allies in France. The Indian fighters carry this weapon on their turbans. It looks very much like an ordinary quoit, but has an edge like a razor. The Sikh throws the "chakkar" by twirling it around in his hand and then suddenly releasing it. Whirling through the air and revolving horizontally, it makes a terrible wound on striking. At 12 yd., a "chakkar" will cut a 2-in. bamboo in two.

NEW TYPE OF TWO-CYCLE GAS ENGINE

In a two-cycle gas engine recently invented the entire control of the gas is accomplished by means of a sliding sleeve that works between the piston and the wall of the cylinder. This sleeve is operated by the crank shaft, being connected with a crank arm set to one side of the crank arm with which the piston rod connects. The crank arm for the piston has a throw of 4 in., and that for the sleeve a throw of 2 in., making the throw of the piston 2



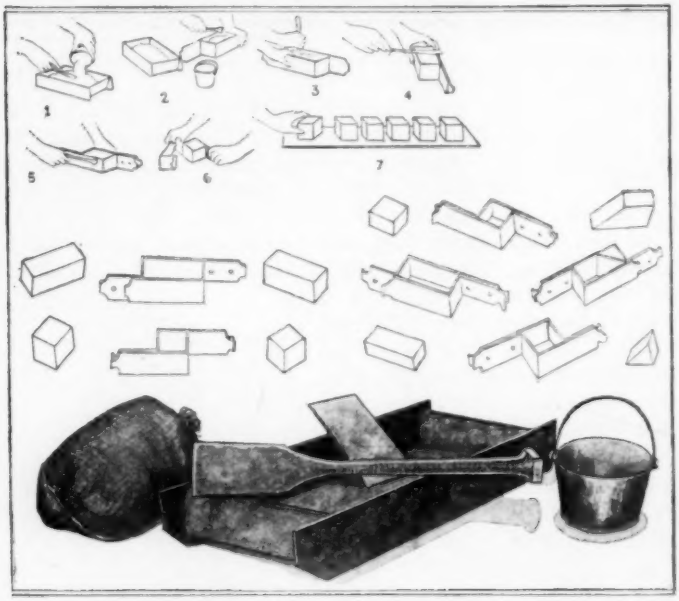
New Two-Cycle Gas Engine in Which the Gas is Entirely Controlled by a Sliding Sleeve

in. greater than that of the sleeve. In addition to this, the short crank arm is set about 20° ahead of the long one,

these arrangements being necessary to provide a proper registering of the openings in the sleeve with inlet and outlet ports in the piston and cylinder. The gas is admitted to the crank case through an inlet port near the lower end of the cylinder. When the piston is at the end of the downward stroke this port is closed by the sleeve. In this position openings in the piston and sleeve register with each other and with a port leading to a by-pass through which the gas, which has already been admitted to the crank case and compressed by the piston, is passed around the piston to the upper end of the cylinder. At the same time, an opening in the upper end of the sleeve registers with the outlet port for the exhaust gases, the adjustment being such that the fresh charge helps to scavenge the cylinder without permitting any waste of gas through the outlet port. As the piston rises, compressing the charge, the inlet port is uncovered by the sleeve, permitting a fresh charge to be drawn into the crank case, and, with the piston at the end of the upward stroke, an opening in the sleeve comes into register with the spark plug, causing the charge to be fired.

TOY OUTFIT FOR MAKING CONCRETE BLOCKS

Among the toys of a constructive nature which have been introduced of late is a concrete-block making outfit which has the double advantage of being educational as well as entertaining. It is not surprising, in view of the widespread use of cement as a building material, that children's playthings should in some way be influenced by this product, but it is interesting to note in what way this has manifested itself. The toy in question is one of very modest proportion. Its parts consist of a tiny bucket, combination spade and tamper, a sheet-metal mortar box, a couple of iron castings and wood blocks for molding purposes, and a small bag of sand and cement of the proper mixture. The whole paraphernalia fits in a pasteboard box of pocket size. With it a youngster is able to make his own blocks, and in a half-dozen shapes and dimensions. With these he may build houses that look like houses, or a whole city of them if he wishes. The extent of his building operations depends solely upon his store of cement, which may be of almost any commercial brand. Here an advantage comes, for the boy, although he may be only five or six years of age, may learn to mix cement, mold it into different forms and then erect something with the blocks thus produced. The



The Toy Concrete Outfit, Showing, Above, Each Step Taken in Making the Small Blocks and the Different Shapes and Sizes in Which They may be Produced

educational value of this is considerable, for a child teaches himself something which is of permanent value and unconsciously instills in his make-up that spirit of enterprise which is most necessary for his proper development.

ALASKAN FISH SHIPPED VIA CANADA TO UNITED STATES

The rapid development of Prince Rupert, B. C., as a fishing port because it is now a western terminus of two great railway systems, the Grand Trunk and the Northern Pacific, threatens to divert a considerable amount of the fish trade from Ketchikan, a coast town in southern Alaska, whence the fish are shipped to Seattle and thence eastward. The establishment of these new routes results, rather oddly, in the fact that fish caught by Alaskans, in United States waters and destined for United States markets, are being shipped through Canada. One of these new lines has put on a through express service and it is said that they can get fish to cities in the eastern United States two days quicker than can shippers using the Seattle route. Canadian laws now permit American fishermen to land their cargoes at Prince Rupert free of duty and send them in bond through Canada to the United States. Ketchikan, fearing a serious diminution of its fish trade, has petitioned the authorities at Washington for protective legislation.

The bulk of the fish shipped from these northwestern waters is halibut. Parties of fishing boats spend from 10 days to two weeks on a fishing trip; as soon as fish are brought on board they are cleaned and put on ice. When taken to port the fish to be retained in cold storage are kept for 24 hours at 10 to 20 degrees above zero, after which each fish is dipped several times in fresh cold water and so given a coating of ice. Thereafter fish can be kept in cold storage at about four degrees below freezing. When wanted, the fish are wrapped in heavy paper, put in paper-lined boxes holding 375 lb. each, and shipped east in cold-storage trains.

BURNISHED-METAL MIRRORS FOR SOLDIERS

A pocket mirror of burnished metal that fits into a neat khaki case is one of the handy toilet articles which is

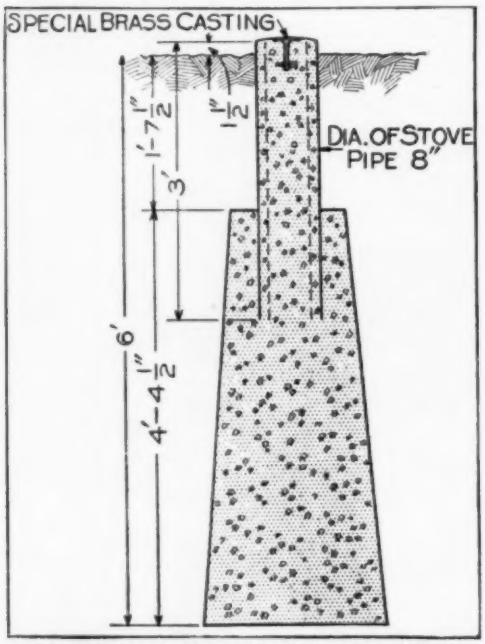
Many European Soldiers in the Trenches are Now Using Pocket Mirrors of Burnished Metal

proving popular with the soldiers in the trenches in Europe. This convenient mirror is scarcely as thick as a looking-glass and cannot be broken as can glass, yet it possesses a reflecting surface quite as brilliant. A metal loop at one end of the mirror serves as a handle.

STOVEPIPE FOR MOLDING CONCRETE BENCH MARKS

Sections of ordinary stovepipe are used in Milwaukee for molding the cylindrical concrete bench marks that serve as reference points for establishing elevations in that city. A solid-concrete base is first built with the section of stovepipe set in and projecting from the top. The stovepipe is then filled with concrete and the top is finished with a brass casting that is set

at a specified height above mean lake level. The stovepipe eliminates an expensive cast form heretofore used, and



Concrete Bench Mark Adopted as Standard in Milwaukee: A Section of Stovepipe is Used for Molding the Upper Cylindrical Part

is said to have resulted in a reduction of about 75 per cent in the cost of building the bench marks.

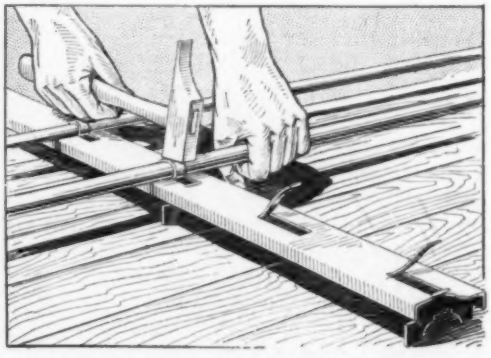
MINOR MOTOR-CAR PATENTS TO BE CROSS-LICENSED

To put a stop to unprofitable and recurring litigation over the infringement of their respective minor patents, 79 motor-car manufacturers, members of the National Automobile Chamber of Commerce, have joined in an agreement whereby these makers may license one another under patents which they control affecting minor forms of improvement, but which are in no way fundamental. Many motor-car producers have long felt that the legitimate profits in their line of business have come from the scientific manufacture and selling of cars and not from the exploitation of minor patents that generally do not represent more than incidental development. It is believed that this interchange of patents, or cross-licensing, will gradually result in a tendency to standardize many additional features of automobile building and will permit more energy to be devoted to the fundamental problems of construction and questions of design regarding which there remain genuine differences of opinion.

SPACING BAR SIMPLIFIES CONCRETE REINFORCING

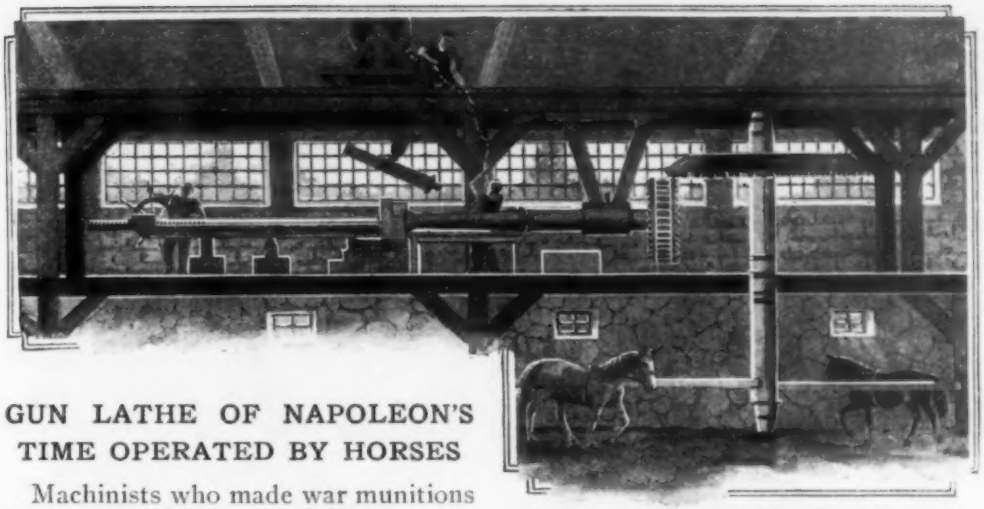
Laying of steel bars for the reinforcement of concrete structures is usually attended with much tying and cross tying of the metal to hold it in proper position before pouring. This is generally done simply by twisting bits of wire around rod intersections, giving them greater or less stability. As a more efficient method of handling the proposition, a spacing bar has lately been invented. This consists of a sheet-iron strip given a channel cross section and having numerous tongues of metal punched out of one side. In use the strips are placed crosswise of the general reinforcing, and the tongues hammered down over the separate rods, thus holding them a fixed distance apart.

The operation is quickly accomplished and is effective in action. The



Spacing Bar Holds Concrete Reinforcements Firmly in Position

spacers become molded in the concrete along with the rods, and may thus serve to give some lateral reinforcing.



Machinists of Napoleon's Time Bored Cannon in Wooden Lathes Driven by Horsepower

GUN LATHE OF NAPOLEON'S TIME OPERATED BY HORSES

Machinists who made war munitions in the time of Napoleon I had no such equipment and tools as those of the present day possess. According to an old-time sketch recently brought to light, cannon were bored by means of a wooden lathe driven by horsepower. The horses traveled in a circle in the lower part of a building, turning a prodigious axle, to the upper end of which a crude but huge gearwheel was attached. This propelled a smaller pinion mounted near its periphery, and the pinion in turn revolved a chuck in which one end of the cannon was attached. The boring tool was advanced by a man operating a handwheel at the far end of the machine. Another handwheel, on a small traveling car above the lathe, lowered the cannon into place, or removed it when machined.

GAS STOVES FOR MOTOR AND YACHT PARTIES

Alcohol-gas stoves made with one, two, or three burners, have proven convenient for use in homes where gas is not available and for motor or yachting parties. The stoves have a gravity feed, use denatured alcohol which is transformed into gas, and are always ready for instant use. A popular form of this type of stove is one with two burners, nickelplated and fitted with black-polished handles, by which the flames are controlled. The alcohol is contained in a receptacle mounted above and back of the stove. Chafing dishes and percolators are also constructed on the same principle. It is

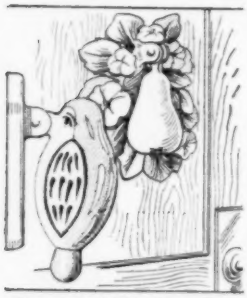
This Portable Gas Stove Burns Denatured Alcohol and Is Suitable for Light Housekeeping as Well as Outings

said that 25 cents worth of denatured alcohol will supply two burners for eight hours.

The two-burner stove has proven particularly popular with picnicking motorists.

¶An eastern firm, finding laborers scarce, recently advertised for one-legged men for certain tasks that could be performed by laborers so maimed.

NOVEL AND PRACTICAL THINGS FOR THE HOME



Decorated Knockers for Bedchamber Doors

HAND-decorated door knockers for interior purposes are being made in a number of odd patterns. Birds, flowers, fruits, and similar things, are the subjects of some of the designs, which are finished in bright colors and intended principally for the doors of colonial bedrooms. They are smaller than those customarily used on the exterior.

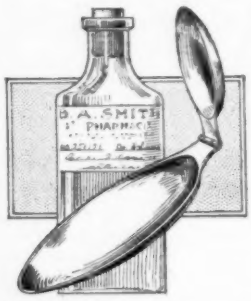
Scouring Mop Cleans Pots and Pans Quickly

For scouring pots and pans a friction swab has been introduced, which is made the same as an ordinary dish mop. It differs from the latter only in that the individual strings composing its cotton tangle are wound with fine copper wire. It enables the most disagreeable part of dishwashing to be done without placing the hands in greasy, hot water.

Mask Enables Person to Sleep in Daytime

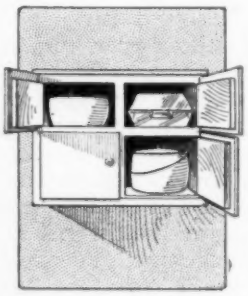
Designed so that it fits snugly over the eyes, shutting out all light, a black mask has been devised for persons who find it difficult to sleep after dawn. It is especially adapted also for night workers, and others who live according to an inverted schedule and do their sleeping during the daytime. It is made of soft material, is not discomforting, and stays in place.

Quite a neat accessory for the medicine case, especially when one spends considerable time traveling, is represented by a teaspoon and tablespoon measuring device. It is made of silver and consists of two bowls, hinged together so that they may be folded compactly and slipped into a small chamois bag. It serves very nicely as a modest practical gift, for it is both novel and serviceable.



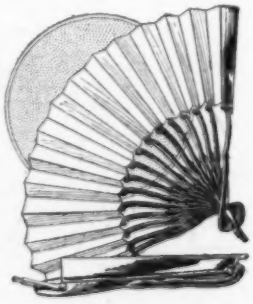
Medicine Spoon Arranged in Neat Form

Convenient features for the housewife are embodied in a four-compartment fireless cooker intended to be attached to a kitchen wall at a suitable distance from the floor. It is equipped with special utensils to which soapstones are attached so that its use is somewhat simplified. The outside is made of wood, finished according to the wish of the purchaser.



Wall-Cabinet Fireless Cooker for Kitchen

To permit it to be carried in a small hand bag, a folding paper fan is being made for women. When opened it is 8 in. in length, but when closed it is only half that size. Its ribs are made



Folding Fan Which may be Carried in a Hand Bag

in two parts and hinged. When in use it is as rigid as most fans, and bears no noticeable evidence of its difference from ordinary ones.

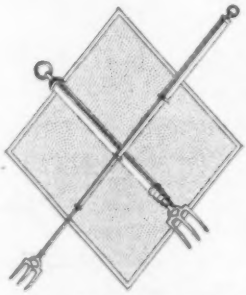
Shoes for babies who have just learned to walk are being made with small rubber-covered canvas disks set into the soles, to prevent slipping. These contact points remain intact until the shoes become pliable through wear and are properly shaped to a child's feet.

Rubber-Covered Disks Fitted to Child's Shoes

Among the late jewelry novelties now being shown is a combination penknife and pencil, suitable for either a man or woman. It is thin, of neat size, and available in both solid gold and sterling silver. It serves especially well as an anchor piece for a man's watch chain. As an accessory for a woman's hand bag, or desk, its convenience is obvious.

Attractive Combination Penknife and Pencil

Telescoping toasting forks that may be extended to various lengths up to 3 ft., are very serviceable when used at an open fireplace. They have four brass segments which slide within each other easily but remain rigid. The prongs are of nickel. The device is also very useful when cooking is being done over a campfire.

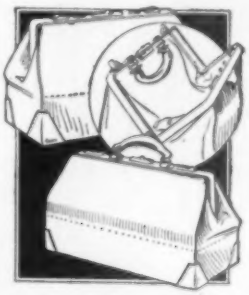


Convenient Toasting Fork Which Telescopes

For invalids, and others who experience difficulty in keeping their feet warm, an electric foot-pad is made with slipper tops attached to it which cover the ankles. Connection may be made with any light socket and the device used when the patient is in bed or supported in an armchair. It may also be used as a bed warmer.

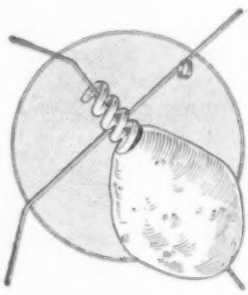
Foot Warmer of New Type for Invalids

Insurance against the theft of one's personal baggage is given by a new type of traveling bag, the handle of which is hinged to the inside, instead of the outside, of the case. When this grip is turned down and the bag locked, no hold is offered. This absolutely prevents mistakes and gives reasonable security against theft.



Traveling Bag with Disappearing Handle

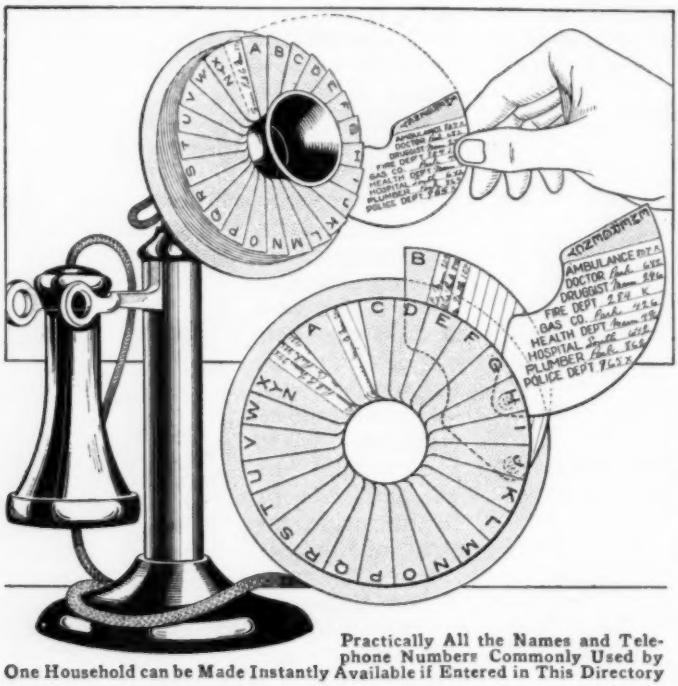
To prepare vegetables, such as potatoes, parsnips, and carrots, for stuffing, a handy corer has been devised. It consists of a long bent wire, near to one end of which a small sharp ring is attached. By forcing this into a vegetable and then twisting it, a clean hole is bored. This in turn may be filled with minced meat, and the vegetable baked in the usual manner. The part removed from a vegetable by this operation comes out in a spiral form, and may be made use of if desired.



Serviceable Vegetable Corer for Housewife

DIRECTORY FOR MUCH USED TELEPHONE NUMBERS

A device on which may be conveniently listed several scores of much used telephone numbers and corresponding names, consists of a disk, in the center of which is a circular hole large enough to permit the disk to be fitted over the mouthpiece of a telephone. Fastened to the disk by pivoting rivets are a number of overlapping leaves, semicircular in shape and so arranged as to cover the disk. The exposed edge of each leaf is marked with a letter. Any leaf can be brought fully into view by swinging it outward, in the plane of the disk. Upon each of these leaves may be written telephone numbers and names. Any leaf can be brought into a position where it can be easily read by revolving the whole device.



Practically All the Names and Telephone Numbers Commonly Used by One Household can be Made Instantly Available if Entered in This Directory

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¶ Of the 52,561 men on board vessels of the United States Navy, 47,664 were born in continental United States; of the remainder, 1,900 were born in our oversea possessions.

EASTERN CANADA'S INDIANS CALLED TO COLORS

The Indians of eastern Canada have been called to the colors. During the early months of 1916 the Dominion has been engaged in raising its quota of soldiers from a quarter of a million to half a million men and the Canadian minister of militia has sent word to the various tribes in the eastern provinces that men from their number are eligible for service. At the beginning of the war many Indians sought to enlist but were refused on order of the war office at Ottawa. As yet no announcement has been made regarding the tribes in the West, which include perhaps 10,000 men, who might be quickly turned into good soldiers and many of whom are excellent marksmen. Several of these tribes have already shown their interest by subscribing to various war funds. The vast majority of the Canadian Indians are wards of their government and have been ineligible for military service. The recent invitation for them to enlist has had no parallel since 1812.

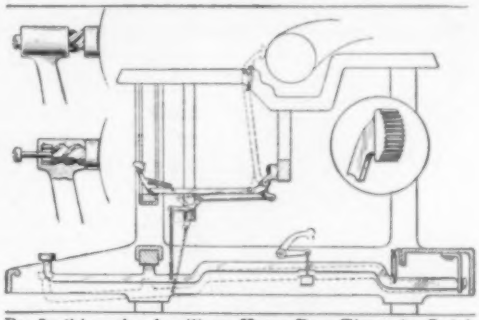
MOTOR-CAR DEATHS LESSEN AS MACHINES INCREASE

Motor cars are increasing much more rapidly than the number of fatalities due to them, according to preliminary mortality figures for 1914 which have recently been given out by the Bureau of Census. During a five-year period ended with 1914, the number of cars increased more than twice as rapidly as did the list of casualties caused by them. There were approximately 200,000 machines in use at the close of

1909, while at the end of 1913 the number was about 1,270,000. At the finish of the following year automobiles numbered 1,750,000. Fatalities caused by motor-car accidents in the death-registration area, which at that time embraced 56 per cent of the country's population, increased from 632 in 1909 to 2,623 in 1914. On the other hand, the number of casualties due to cars in a greater death-registration area embracing 65 per cent of the population, increased from 2,488 to 2,795 from 1913 to 1914. These figures show that during the five-year period, motor cars increased 775 per cent while the casualties increased 315 per cent. Between 1913 and 1914 machines increased 38 per cent and fatalities 12 per cent. Two possible reasons for this decrease in casualties are advanced in the government's resumé; one being a reduction in the average mileage per machine, and the other that cars are being driven with greater regard for public safety than in the past. In considering the statistics, however, it is not amiss to remember that machines are distributed according to the concentration of wealth in the various parts of the country rather than in relation to the density of its population. Manufacturers have been turning thousands of cars into the West. Also the motor car of today is much more easily controlled and responds more quickly than earlier types, and pedestrians are more careful than heretofore.

ERASING ATTACHMENT MADE FOR TYPEWRITERS

Designed so that it is operated by striking an auxiliary key, an erasing attachment that may be attached to a standard typewriter has been patented. The face of the eraser, made of metal and mounted at the end of an arm pivoted to a lever, between which members a spring is fixed, is cut by a number of transverse teeth. The carriage does not move when the erasing key is struck, but remains stationary. The eraser strikes the top of a character, missing the ribbon, and is drawn downward by the action of the spring, cutting into the paper sufficiently to remove the inked impression of a letter.

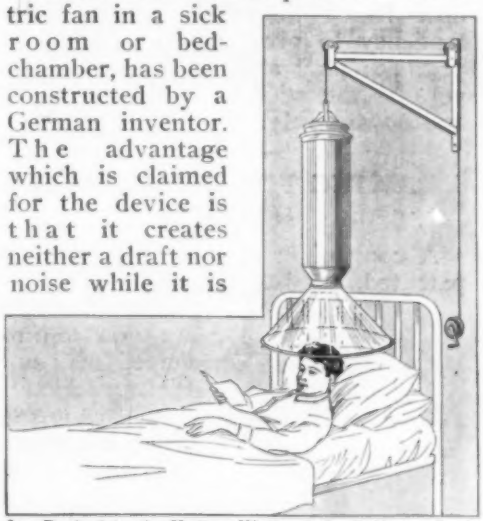


By Striking the Auxiliary Key a Few Times in Quick Succession an Erasure is Made. This Action does Not Cause the Carriage to Move

A modification of the same device has been designed which allows the use of a rubber eraser instead of a metal one. In this instance the head revolves upon striking the platen.

AIR COOLER FOR SLEEPING AND SICK ROOMS

An air-cooling apparatus which is intended to be used in place of an electric fan in a sick room or bedchamber, has been constructed by a German inventor. The advantage which is claimed for the device is that it creates neither a draft nor noise while it is in use. It consists of a hollow-walled cylinder, packed with ice, at the bottom of which is a funnel that gives the descending cool air a tendency to spread out as it strikes the bed over which the apparatus is swung.



Ice Packed in the Hollow Walls of the Cylinder Cools the Atmosphere without Creating a Draft

DEVICE PREVENTS RATTLING OF WINDOWS

An attachment to prevent the rattling of windows has been patented by a New Jersey inventor. It consists essentially of a swinging arm, having a notch in the front side near one end into which is fitted the end of a curved spring. The latter curves downward about the arm. Attached to the free end of the arm is a roller. The device is fastened at its pivoted end to the side of a curved recess cut in a window sash, as shown. When the sash is fitted into the window frame the roller, which has a tendency to press against the latter, prevents play and at the same time permits the window to be moved up and down freely.

DRAWING PIN HAS MOVABLE HANDLE

A convenient drawing pin, recently patented, consists essentially of a head formed by an upper cup-shaped disk and a lower circular disk, between which is a smaller head from which projects a sharp point, or pin. The edge of the upper disk is turned over into an annular recess, which thus presents a flat bearing surface. A feature of the pin is a semicircular handle, the ends of which are turned in to engage holes in the sides of the head. One-half of the head may be made of smaller radius than the other half, thus permitting the handle to be turned down flat and thereby completing the circle of the head.

NEW Y. M. C. A. PLANT COSTS OVER MILLION AND HALF

The central branch of the Young Men's Christian Association of Brooklyn, N. Y., recently dedicated a new building which cost $1,600,000 and is said to be by far the largest and most expensive Y. M. C. A. building in the world dedicated entirely to association work. This splendid structure has a frontage on three streets of 111 ft., 126 ft., and 192 ft., respectively. There are 13 floors above ground and two below. On the roof are three four-wall handball courts. It is believed that no other association surpasses this one in its facilities for carrying on its work.

The building contains 510 living rooms, three gymnasiums, two swimming pools, two billiard rooms, 10 bowling alleys, and educational equipment for 2,000 students. The entire eighth floor is devoted to the latter phase of the work; here is found every facility for day and night classes, including chemistry and physics laboratories. A great variety of subjects will be taught, ranging from operation of motion-picture machines to bookkeeping.

Unusual attention has been given to the plumbing in connection with the gymnasium baths, swimming pools, and the shower baths on each of the dormitory floors. But there is only one bathtub in the entire plant. This is located in the hospital ward. Bathtubs are regarded as insanitary and agents of infection, hence they have been dispensed with.

About one-fourth of the ground floor is occupied by an auditorium having a full theater equipment and seating 650. The larger of the two swimming pools measures 25 by 75 ft. and, like the smaller one provided for boys, is supplied with water which has been softened and filtered.

Waterproofing Concrete Work

For the purpose of waterproofing concrete there is nothing better than the commercial waterglass, which is a solution of sodium silicate. Dilute the waterglass with four parts of soft water. Apply with a flat brush, thoroughly wetting the surface.

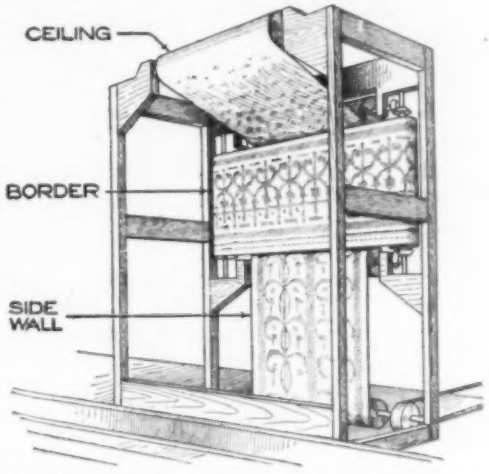
Another method is the use of copper sulphate, also known as blue vitriol. One pound, dissolved in 4 gal. of water and applied the same as the waterglass, will give excellent results. The sulphates of aluminum, zinc, or iron can also be used, but the copper solution is by far the cheapest and most efficient.

Waterglass is the best water-resisting agent, for its combination with the calcium of the cement is a chemical one, forming an insoluble silicate of that element. Incidentally the waterglass may be colored by mineral pigments, thus at the same time forming a waterproof color for concrete.—A. E. Soderlund, New York City.

Wall Paper Window-Display Machine

A dealer in paints and wall paper devised an ingenious display machine to show his stock of wall papers to his patrons. It is also used in the show window during the dull season, and has proven to be a good advertiser out of season.

The machine is driven by a motor, and the elements are three pairs of cylinders which are mounted in a frame and slowly revolved, one pair for ceiling paper, one pair for borders, and one pair for side walls. A canvas belt, about 200 ft. long, connects each pair of cylinders, and as it unwinds from one it winds up on the other, making a large roll. Each pair of cylinders starts to wind at the same time, and when all three are unwound, a reverse gear is slipped in, and the belt runs back on the first roller. The mechanism is provided with an ingenious device to keep the surface speed of the belt always the same. Between each pair of cylinders the belt runs on a tangent, or



Three Pairs of Rollers with Long Belts of Canvas for Displaying the Combinations of Wall Paper

straightaway, and this part is the part that is visible to the spectators.

On the canvas belt are pasted the wall-paper samples. The machine is so arranged that three harmonizing kinds of paper are visible at a time, thus giving a good idea of how a room would appear with that paper combination. For use in the display room the motor may be disconnected, and each of the three roll systems worked independently by hand. The customer, seated comfortably in a chair, can judge the effect of the different combinations of border, ceiling, and side-wall papers.

¶The diametral pitch of a gear is the number of teeth to each inch of its pitch diameter.

Advertising Signboard for Farmers' Products

The farmers in one locality use a novel signboard to advertise their farm products. Instead of the usual painted

The Signboards are Held in Place between Posts Where They are Quickly Inserted

slab, or blackboard, the passing autoist, or summer visitor, finds a neatly painted sign with all of the good things in the farmers' market for that day, for instance, "New Beets," "Shell Beans," "Fresh Killed Chickens." Upon closer examination the sign will be found to be constructed so different panels with the articles for sale may be quickly inserted. A stock of these painted boards is kept to correspond to the different seasons of the year for the things on sale. The boards are usually painted white with black letters, and present a neat appearance.—Contributed by George H. Davis, Jr., Braintree, Mass.

Transplanting Plants

In changing the location of plants from one place to another they will stand a greater chance for thrifty growing if the earth around the roots remains undisturbed. This can be accomplished by digging a trench around the plant and binding the earth together with a piece of ordinary wire window screen. This screening must reach down as far as the ends of the roots. Cord wrapped around the screen will hold the earth in a compact mass.

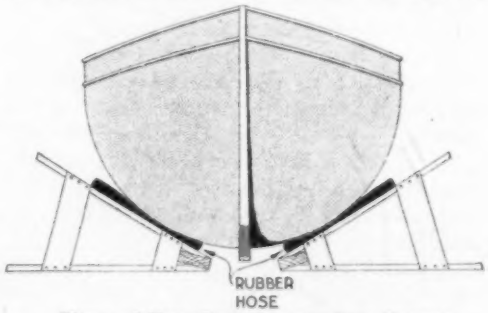
The mass can be grasped at the bottom with the fingers, in the earth under the screening, and lifted bodily out, then placed in the new hole, or a spade can be inserted under the screening and the mass lifted. The wire screening need not be removed, as it will rust out in a short time.—Contributed by James A. Hart, Philadelphia, Pa.

Pulling a Well Casing

When a well casing will not start with the jacks, or when it comes up so slowly that it cannot be seen moving, and is pulling hard, stop pulling, run the bailer two or three times, and the casing will come easily. Always leave the bailer down at the bottom of the hole. Should the casing tighten up again, repeat the bailing, and take out two or three more bailers of water. On one occasion when two jacks, each of 40 tons capacity, failed to start 232 ft. of 8-in. casing, we loosened it up by running the bailer three times. Well diggers should try this, and they will never lose another well, or string of casing, by stripping the threads at the joints.—Contributed by J. J. Coughlin, Versailles, Ohio.

A Cradle for a Boat

A pair of sawhorses, with pieces of old garden hose tacked on, to prevent marring the surfaces, make a good cradle for a boat. When not in use for



Pieces of Hose Tacked on the Legs Protect the Boat Surfaces

that purpose the horses can be used in the ordinary manner.—Contributed by J. J. OBrien, Buffalo, N. Y.

MOTORCYCLE TRAILER AND CAMP OUTFIT

By T. T. Sturgeon

INSTEAD of the ordinary sidecar so much used by motorcycle owners I constructed the trailer and camp outfit herein described to take its place. A companion and I made a 600-mile tour with it over some of the worst desert and mountain roads in the western states. The trailer proved its practicability and its advantages over the sidecar. There was no side drag on the motor, and, as the pull was straight backward, the motor was held steady in the sand ruts. Another great advantage over the sidecar is that the trailer can be detached by pulling out a pin when it is desired to make short side trips. Many conveniences may also be incorporated in it that would be impossible with a sidecar permanently attached to a motorcycle.

The complete equipment consists of the following units: trailer car, nested mess kit, tent and sleeping bags, and a complete photographic developing outfit for field work. The total weight of the outfit, with the necessary foodstuffs and motor-repair parts, is slightly under 250 lb. This weight may seem excessive, but it did not prove so, even on bad roads, and upon one occasion 100 miles of good road was covered in five hours.

The first part of the equipment to be taken up in detail is the trailer chassis, which is shown in Fig. 1 ready for the installation of the body. The illustration shows the axle straight. A 3 or 4-in. dip made in it will lower the center of gravity. The bend in the axle being outside the springs, the tread will be about 6 in. wider, but otherwise the dimensions given are satisfactory.

The measurements for the chassis are as follows: The axle is of steel, 33 in. long and ⅞ in. in diameter, turned down at the ends to fit the cones of the ordinary sidecar wheels, and threaded on each end to receive a ½-in. castellated nut, which is locked with a cotter. The springs were obtained from the junk pile of a local wagon maker. They consist of the lower halves of ordinary buggy springs, measuring 33 in. long and 1¼ in. wide. As the springs were too stiff, only the three larger leaves were used, these being secured to the axle with strap bolts or axle clips.

One of the rear-corner joints is shown in Fig. 2. The sidepieces are 38½ in., and the ends 19 in. long, and of 1½ by 1½-in. angle iron. One face of the end pieces is cut 22 in. long, to permit a 1½-in. lap for riveting to the side members, as shown at A. The method of mounting the springs is shown at B. A piece of ⅛-in. sheet steel, 3 by 4½ in., forms the rear bracket, which should be of such quality that it will stand hardening. A slot,

1½ in. long by 5/16 in. wide, is cut through the sides to receive a hardened-steel bolt passing through the spring end in such a manner that it will ride in the slots of the bracket. The front-spring bracket is similar but without a slot, having a hole for the bolts, and does not need to be hardened.

The tongue, drawhead, and automatic brake are shown in Fig. 3. The tongue consists of two pieces of 1 by ⅛-in. angle iron, 52 in. long, and the drawhead is made of a 6-in. length of ¾-in. pipe, with a pipe cap. The lengths of angle iron are bent slightly, at C, to permit bolting them parallel with the drawhead, and to make a spread of about 10 in. where they connect with the front member of the frame. The drawhead is attached to the tongue pieces with machine screws locked with lock washers. The ends of the screws that project inside of the pipe should be dressed off smoothly, to permit the free action of the drawbar.

The drawbar is made of a machine-steel eyebolt, 6 in. long and ½ in. in diameter. The bolt slides through a hole in the cap, against which a spring is placed. It exerts pressure on two nuts on the end of the drawbar, working easily inside of the drawhead. The spring can be adjusted by the nuts on the bar. This arrangement forms a swivel-and-spring drawhead, which is very important, as the safety of the trailer depends greatly upon it. The nuts on the end of the drawbar should be securely locked, to prevent them from coming off and thus releasing the drawbar. A little cup grease should be packed in the spring for lubrication, as the drawbar is constantly working back and forth when on the road.

The automatic brake may appear unnecessary, but it is a great convenience when some of the draft rigging breaks. Also, in an emergency the trailer may be cut off while in motion to prevent a "spill," and the brake will prevent it from running over a bank or into another vehicle. When making camp, it saves searching for something with which to chock the wheels. If the car is taken down a steep place by hand the brake is needed. It is self-locking and equalizing when set. It took considerable experimenting to find the exact shape and dimensions of the levers.

The working details are shown in Fig. 4. Two brake beams and shoes are required, which are made from metal, ½ in. wide and ¼ in. thick. The beams are bent as shown at D, which is the center of the angle and the point where the tangents of the two legs cross each other, the exact locations of the holes being found from this point. The shoes E are made of steel, 1 in. wide and 1/16 in. thick, riveted to the beams at F. The two beams are pivoted to the frame at G, Fig. 3, 4½ in. from the front end piece, and ½ in. from the edge of the side member, inside measurements, the pivot bolts being 3/16-in. stove bolts with lock washers.

The bends, to make the peculiar shape of what may be called the trigger, must be made accurately, to insure the proper adjustment and operation of the mechanism, hence the working details must be observed. The lever is attached, at H, Fig. 5, to the right brake beam, the short piece J being coupled to the trigger, at K, and to the left beam; stove bolts with lock-nuts being used throughout.

The automatic release, Fig. 6, consists of an 8-in. auxiliary wheel supported in a U-shaped bracket, made of ¾-in. channel iron, 6 in. long on each leg. A 1-in. slot, wide enough to permit the shaft of the small wheel to slide freely in it, is cut in each leg. The bracket is fastened to the cap on the drawhead with a machine screw. The sides of the channel are filed at an angle to fit the cap snugly, when the bracket, drawbar, and braces are joined. They should be joined so that the longer sides of the triangle formed are equal.

The braces are made of 5/16-in. iron rod, having eyes formed in their lower ends to fit the wheel shaft. They are flattened on the opposite ends for bolting to the tongue sections, their length

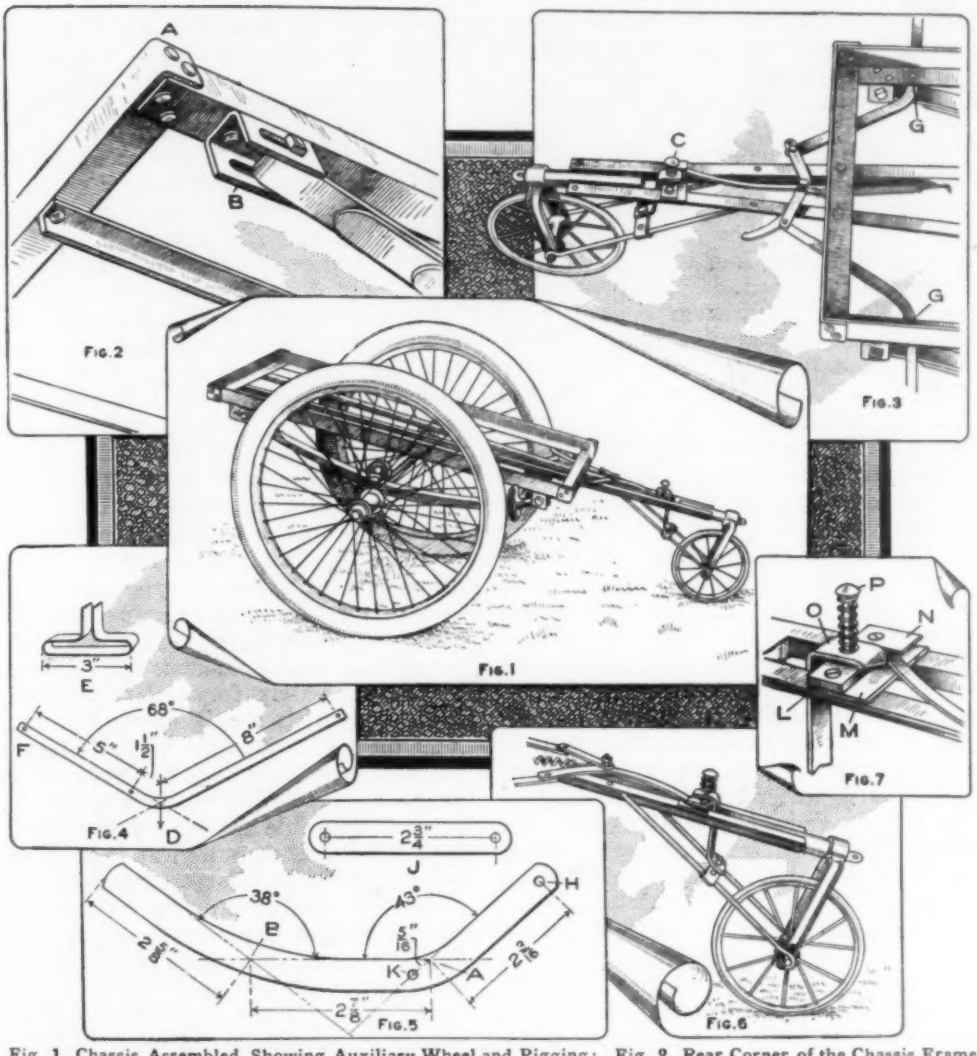


Fig. 1, Chassis Assembled, Showing Auxiliary Wheel and Rigging; Fig. 2, Rear Corner of the Chassis Frame, Showing Corner Joint A, and Spring Fastening B; Fig. 3, The Auxiliary Wheel Frame and the Braking Mechanism; Fig. 4, Brake Beam and Shoe; Fig. 5, Trigger and Trigger Strap; Fig. 6, Auxiliary Wheel, Showing Trigger Device, Braces, and Slotted U-Bar; Fig. 7, The Trigger Device

being such that the center of the shaft will be about 13 in. from the point at which they bolt to the tongue. If the parts are set properly the auxiliary wheel will work freely in the slots, the natural spring in the brace rods tending to hold the wheel at the bottom.

The release-catch feature is simple. At a point 8½ in. from the front member of the frame, two holes are drilled and tapped for machine screws. Two plates, L and M, Fig. 7, one 2¾ in. long, 1½ in. wide, and 1/16 in. thick, and the other 2¾ in. long, ¾ in. wide, and ¼ in. thick, are attached to the tongue by the screws, as shown. A small piece of metal, N, is placed on top of the thicker plate, to prevent the trigger from rising out of place when the catch O is pushed up. A carriage bolt, P, is screwed into the plates at their center, with a locknut to hold it on the under side. The catch O is drilled to permit free action on this bolt. A light spring is placed between the catch O and the head of the bolt. The

release is fastened to the braces by means of a strap and stove bolts, as shown in Fig. 6.

The action of the brake is as follows: When the trailer is released from the motor the tongue drops; the auxiliary wheel, coming in contact with the road, rises in its slots, pushing the catch up to clear the trigger, and a coiled spring at the middle draws the brake beams into action. This spring does not hold the brakes in contact with the wheels, but merely starts the action. The braking power is derived from the back pressure on the rod braces, which is communicated to the lever arrangement on the brake beams. The greater the weight pressing down on the auxiliary wheel the greater the braking power.

The design of the body and the arrangement of the covers to form tables are shown in Fig. 8. The dimensions of the box are such that it will fit snugly in the chassis frame. It is made of ½-in. lumber with corner and edge strips to reinforce the joints. The inside edges of the strips are beveled to give a neat appearance to the panels. The box is water-tight, 13 in. deep at the center and 11½ at the ends, the floor resting on the side members of the frame and on the tongue at the center.

A tank, 17 in. long, 10 in. wide, and 4 in. high, of 3-gal. capacity, for a gasoline supply, is set in the rear of the body. It is held in place with cleats, and is made of galvanized iron, with reinforcing plates on the ends.

The front cover is so arranged that it can be attached to the rear of the body for use as a mess table, and for photographic purposes. Folding standards, at the end of the tongue, at the rear of the chassis and under the table, together with the brake make the whole stand firmly. When the table is used for photographic purposes the rear cover, which is hinged to the body, is braced in a vertical position, as in Fig. 9. A collapsible wire frame is attached to the cover by means of screw eyes, on the under side, and a lightproof bag, large enough to inclose the table and the operator, forms a dark room. As it is used only at night, it is satisfactory for this kind of work.

As the motorcycle was electrically equipped for lighting, a small lamp, not shown in the illustration, was bracketed to the rear of the body. The feed wires were conducted to the end of the tongue, where slip connections were provided to connect with a terminal on the motor draft rigging. A long extension cord was provided, permitting the motor to be set at a distance from the car when in camp. The lamp proved to be convenient, being used as a tail light for night traveling, as a dark-room light, and as a table lamp, when the red lens was removed.

The method of coupling the trailer to the motorcycle is shown in Fig. 10. As slightly differing methods will be necessary with varying types of motorcycles, it is offered as a suggestion only. The motorcycle which was used to tow the trailer was provided with sidecar lugs immediately forward of the rear axle, and with small luggage-carrier lugs on the rear forks. A U-shaped piece of strap iron, 1¼ in. long and ¼ in. thick, was bolted to the sidecar lugs at such an angle that the drawhead of ⅝ by 1-in. steel, bolted at the center, would hold the trailer horizontal. The upward thrust of the trailer was prevented by the U-piece resting against the nuts on the rear axle of the motor, the downward thrust being held with ½-in. stay rods running from the lugs, on the rear forks, to the outer curve of the U-piece.

A large cotter, slightly spread, forms the coupling pin, and a cord is attached to it so that the man on the rear seat may release the trailer in the event of a skid or fall. All nuts and bolts must be locked either with split washers or cotters. The load should be packed with the heaviest articles in the center in order to balance the car. Several screw eyes should be placed in the sides of the body near the floor, and a lash rope run through them, with which to lash the load solidly in the car. This prevents shifting and protects the contents in the event of a "tip-over."

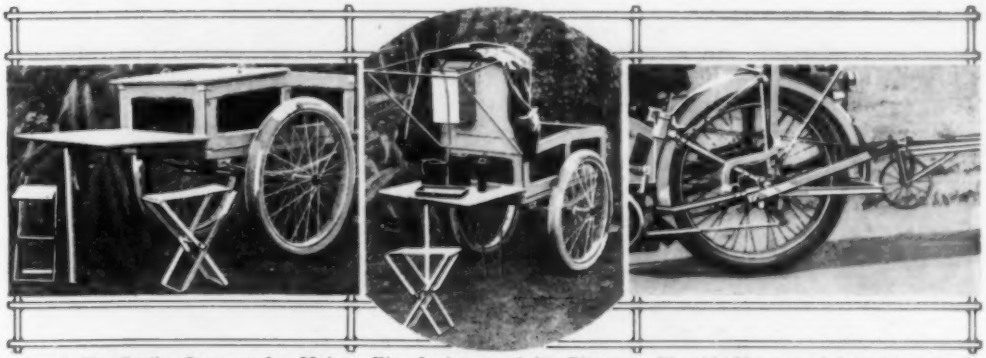


Fig. 8, The Trailer Supported to Make Table Accommodating Two Persons for Meals or Recreation

Fig. 9, Arranged for Photographic Purposes Showing Dark-Room Curtain

Fig. 10, Manner of Attaching the Trailer to Motorcycle for Road Transportation

The Mess Outfit

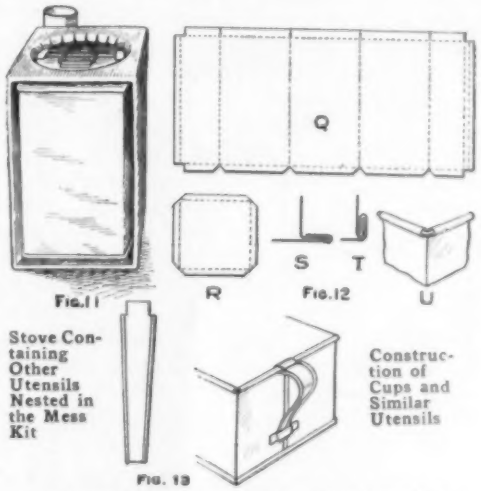
The mess outfit is well adapted for camping, as it provides nearly everything necessary for two persons, and is contained in a small package. While it is designed particularly for motorcycle use, it should prove a serviceable addition to the equipment of the automobile tourist and could easily be made to serve for four or more persons, without enlarging the space occupied by it. Space for extra cups and plates may be obtained by utilizing the space used for food, in the kit for two persons.

An elaborate set of tinners' tools is not necessary in making the outfit; vise, snips, mallet, pliers, hammer, and a soldering iron being the articles required. Short lengths of angle iron, of different sizes, clamped in a vise form the mandrel upon which the bends are made.

The complete outfit nested inside the combination stove ready for transportation is shown in Fig. 11. It occupies a space 7¼ by 7¼ by 12 in., and weighs slightly less than 11 lb. without foodstuffs. It contains the following utensils: coffeepot, two cups, one bowl, stewpan, frying pan, two plates, sugar can, two sets of knives and forks, an extra spoon, and a 2-gal. bucket. There is room also for 3 lb. of bacon, ½ lb. of butter, cans of pepper and salt, ¼ lb. of tea, and a small dishcloth.

Three sheets of heavy tinplated sheet metal, a piece of light galvanized iron, 12 by 36 in., and a piece of black sheet iron, 15 by 50 in., of medium thickness, will provide all the necessary pieces with the exception of the gasoline tank for the stove. If it is desired to use the type of stove shown, a small amount of galvanized iron, of medium thickness, will also be required.

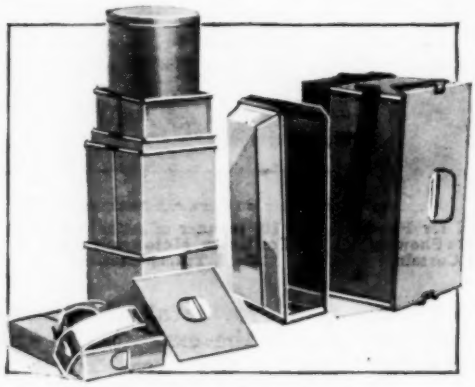
The patterns for cutting and forming the different utensils are shown in Fig. 12. The main pattern Q is for one of the sides. The sheet metal is folded on the dotted lines and the joint placed in the center of one side. On each edge



Layout for Handle and How It is Attached

⅛ and ¼ in. are provided to form the clinch seam, and ⅛ in. on the bottom edge for the joint. At the top 3/16 in. is provided to form a roll around the reinforcing ring.

The bottom pattern is shown at R, the dimensions of which is best determined after the sides have been formed. It is ⅛ in. larger than the bottom half



Mess Outfit Partly Nested

of the clinch. The first operation of attaching the bottom plate is shown at S. The lap of the bottom is folded over the side lap, and clinched as shown at T. The top roll around the ring, which consists of ordinary galvanized telephone wire, is formed as shown at U. The side seams are clinched in the same manner. A small piece of steel, similar to a rivet set, with a notch the size of the seams cut in its face, aids in making the clinch properly.

The detachable handle of the cups and the coffeepot are constructed and attached as shown in Fig. 13. The tongue at the top is formed into a hook and hooked under the wire ring, a bit of the metal of the side having been cut out to permit its insertion. A small strap soldered to the side of the utensil permits the handle to slip down under it when squeezed slightly. The handles are reinforced along the edges with a small wire and a roll.

All the utensils are made in the same manner, with the exception of the stewpan, which has the ends clinched in, the sides and the bottom being made of one piece. The handles of the stewpan are not detachable, but form clasps to hold the lid tight, when the equipment for it and other contents are nested inside. The construction of the bucket is similar, except that larger seams are made. Since a clinch seam is not water-tight, all joints in the bucket must be soldered.

The frying pan is made of the black sheet iron. It is constructed without seams, as shown in Fig. 14, the corners being folded and riveted. A strap is riveted on one end, to receive the detachable handle, which is a short piece of ⅛ by ¾-in. strap iron, with a hook bent upward on the end.

The construction of the plates is shown in Fig. 15. They have a ½-in. double, flat brim around the edge.

Beginning with the smallest utensil, shown in the rear row in Fig. 16, the inside measurements are as follows: first cup, 3½ in. square by 4 in.; second cup, 3¾ in. square; coffeepot, 4 in. square by 8 in.; bowl, 4¼ in. square; sugar can, 1 by 3½ by 6 in.; plate, including rim, ⅞ by 5½ by 9¾ in.; stewpan, 5½ by 6 by 9¾ in.; frying pan, 1½ by 6¼ by 10 in.; bucket, 6½ in. square by 11 in. The covers of the coffeepot and the stewpan are made to fit. The method of forming the edges of the covers and of attaching the handles is shown in Fig. 17.

The assembling of the mess kit is shown in Figs. 16 and 18. When the articles are nested inside the coffeepot, enough room is left on top for the half pound of butter and the bacon. The lid of the stewpan is shown removed in Fig. 18, and space can be seen at the top for cans to hold salt, pepper, tea, and similar supplies.

The stove was designed so that wood or gasoline could be used for fuel. Double the space is needed when gasoline is used, in order to provide a storage tank for the gasoline.

The stove is constructed of heavy sheet iron. The measurements inside are 7¼ in. square by 12 in. A 3-in. hole is cut in one end, and a 6-in. hole in the other. An old brazing torch was used to make the burner for the gasoline stove.

The gasoline supply was set in a galvanized-iron tank, 4 in. by 7 in. square, in much the same manner as it was in the original torch. The generating pan was removed from the feed

stem and placed on the valve stem, permitting generation of gas in the usual way. The pump was placed in a corner. In order to spread the flame over a larger area, a burner cap, taken from a gasoline stove, was attached to the top of the fire head. A stay bolt was run through the center of the tank to reinforce it to withstand the air pressure. Care must be taken not to have too great a pressure in the tank.

When the stove is used with wood as a fuel, it is placed in a horizontal position, with the open side over a small depression in the ground. A heavy wire screen is hooked over the inside edges, where they are turned in, forming a grate. This gives a draft for the fire.

The Photographic Outfit

The photographic equipment need not be detailed completely, as the only point of special interest is the method of washing and drying plates. After taking them from the hypo tank, they were placed in the wash tank. The bucket hanging at the rear lid of the body of the car was filled with water, and a rubber siphon drew the water down to the wash tank, from which it ran to the ground. After the plates had been washed, they were placed in an alcohol tank. The alcohol displaced the water in the emulsion, causing the plates to dry in a few moments, when placed before an electric fan driven by current from the motorcycle storage battery.

The Tent and Sleeping Bag

For the making of the small tent, and two sleeping bags, 21 yd. of canvas are necessary, 8-oz. double-twist khaki drill being the most suitable. One or more blankets for each bag are needed, depending on the temperature in which the bags are to be used.

The dimensions of the tent are approximately 6½ ft. long, 5 ft. high, and 5 ft. wide. This is sufficient to cover a motorcycle and two persons. Two bamboo poles support the tent at the front and rear, a rope ridge support being used.

The method of cutting and joining the canvas, which is 36 in. wide, is shown in Fig. 19. Thirteen yards are necessary for the tent. From this four

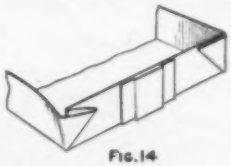


Fig. 14

Fig. 17

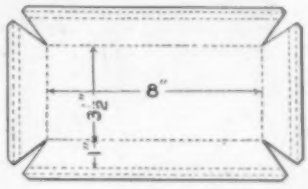


Fig. 15

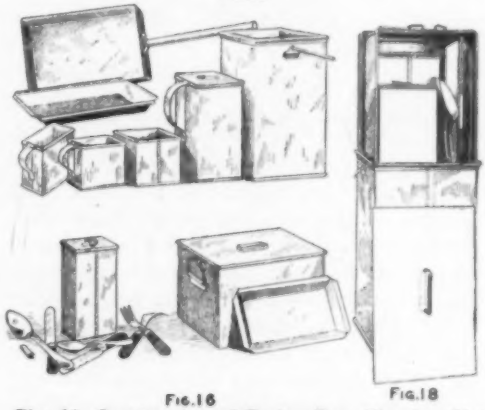


Fig. 16 Fig. 18

Fig. 14, Construction of Frying Pan, Showing Slot for Handle; Fig. 15, Layout for Cutting Metal for Plates; Fig. 16, Mess Outfit Ready for Nesting; Fig. 17, Cover Construction and Fastening of Handles; Fig. 18, Mess Outfit Nested

lengths, 6 ft. 7½ in. long, are cut, thus allowing ¾ in. on each end for the corner seams, stitched together with laps, as shown. One seam is at the ridge and the other in the center of the sides. A ½-in. hem is placed along the bottom edges.

The remainder is now divided and each section equally divided to form the four large gores, A, as shown in Fig. 19. Two of the gores are stitched together their full length, forming the back of the tent, and the other two are stitched about one foot down from the ridge, leaving an opening for an entrance. The front and back are next stitched to the side walls along their

slanting edges. They will be a few inches too long. The part left over is cut off, and the small gores B are made from these scraps. A hem similar to the one upon the sides is next placed on the bottom edge of the end. Eyelets with ⅜-in. holes are fitted along the bottom edges to receive the large spikes used for tent pegs. The ridge rope is then run through the apex of the ends and fastened.

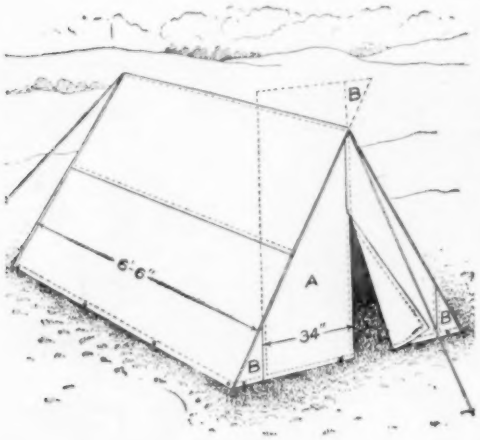


FIG. 12

Tent, Showing Method of Cutting Canvas Economically to Make the Ends

The sleeping bags are each made of 4 yd. of canvas, fashioned like a long envelope. The upper side is 5½ ft. long and the bottom 6½ ft., accommodating a person of medium height. The blankets used inside of the bags should be stitched together with the seam uppermost, and in the middle. The top of the blankets should be left unstitched for about 18 in., as the bag may thus be more readily entered, and the blankets brought closely around the neck of the user. A cord should be run through the bottom seam of the inner bag and through eyelets in the corners of the outer bag, so that the bag may be anchored to a peg, making it easier for one to get out of it.

In connection with the sleeping equipment, a poncho is desirable and can be made from a 48 by 72-in. piece of black oilcloth. A hem should be run around the edges of the oilcloth, and five garment snaps should be sewed on one long edge, in order that the poncho may be thrown around the shoulders and fastened in front.

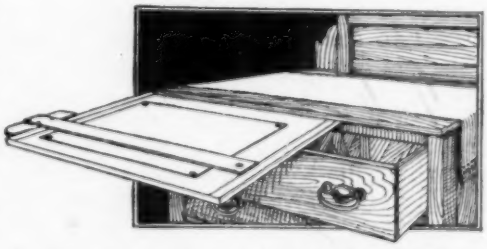
A poncho of this type protects the upper part of the body when walking or riding in the rain, and may be spread over the sleeping bags to protect them when used in the open. Two ponchos may be snapped together to form an auxiliary roof for the tent. A poncho is the handiest article in camp on a wet day, with the possible exception of a water-tight match safe, and, of course, every camper should have one of these.

Dresser as a Drafting Table

A dresser, or bureau, may be made to do service as a drawing table and will be found convenient by students and others who make drawings occasionally. The sketch shows how the board is rested on the edge of the open drawer, and held under the dresser top.

For use in a standing position the dresser will be found convenient, whereas a bureau gives better service for the seated position.

The board should be placed at the left-hand edge of the dresser, so that the same edge of the board extends about 1 in. beyond the side. If the drawer is not firm, small wedges may be inserted between it and the slides on which it rests.—Contributed by Raymond B. Rogers, Newberg, Ore.



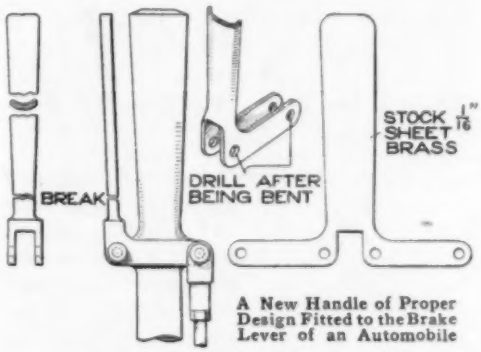
The Board Rests upon the Edge of the Drawer and is Held by the Top

Substitute for a Slide-Rule Glass

In using the slide rule I have found that one of the chief difficulties is the constant breaking of the glass runner. The glasses being quite expensive, the cost of renewing them every time one drops the rule is no small item. A very good and practically unbreakable substitute for these glasses can be made from an old celluloid, or xylonite, triangle which might otherwise be thrown away. The material can be cut to the required shape with a sharp knife. The hair line can then be scratched on with a needle and colored with India ink. I have found this indicator to be fully as good as glass in work requiring the greatest accuracy.—Contributed by George Caynor Hyde, Hoboken, N. J.

Repairing a Broken Brake-Lever Handle

The handle on the brake lever of an automobile broke at the point indicated in the illustration, and knowing



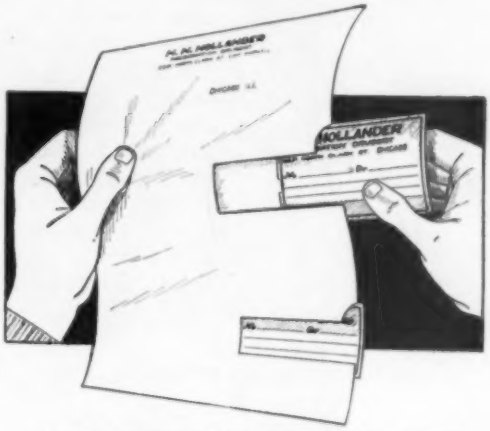
A New Handle of Proper Design Fitted to the Brake Lever of an Automobile

that the break was due to faulty design, I decided to make up a new, entirely different handle.

A piece of sheet brass, 1/16 in. thick, was procured and cut to the proper size and shape, the dimensions being taken from the two portions of the broken handle. The four holes shown were not drilled until the piece was bent into shape. After fitting the new handle, it was carefully buffed and polished.—Contributed by Adolph Kline, New York City.

To Typewrite on Druggists' Labels

A druggist, desiring a neat appearance of labels, found it difficult to typewrite on small sizes, as they could not

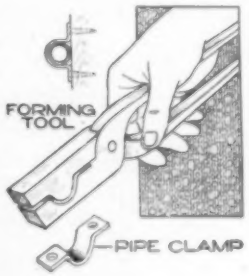


Labels are Inserted into Places Made for Them on a Full-Sized Typewriter Sheet

be kept in the proper place on the typewriter roll. This difficulty was easily overcome by making the holding slip shown in the illustration. An insert was formed for each size of label by pasting a piece of paper on a full-sized typewriter paper, leaving an opening for the insertion of the labels. The opening in front is of such a size as to present the lines on the labels to be filled in.—Contributed by H. N. Hollander, Chicago.

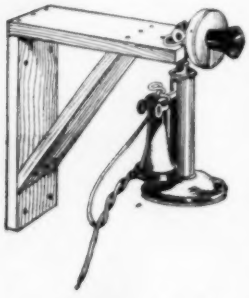
Forming Tool for Pipe Clamps

The sketch shows a pipe clamp shaped from light steel, and a handy tool used to form it. To use the tool, which is made in the form of a pair of tongs, it is opened and the straight piece of steel to be formed is inserted. The upper part of the forming tool is then struck a blow with a hammer, and the clamp is formed.



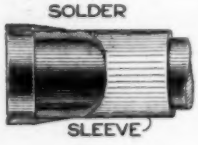
Holder for a Telephone

In order to clear a small desk of a telephone and still have the latter at hand a wall bracket notched to receive the instrument was made and fastened to the wall above the desk. The notch must be made deep enough so that the telephone will not slip out of it easily.—Contributed by Theodore J. Becker, Kansas City, Mo.



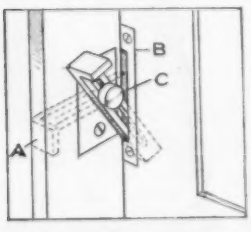
Covering Space on an Automobile Crank Handle

The space between the revolving sleeve and the pinhead on the starting crank of my automobile allowed the flesh of the hand to squeeze in and get pinched, or cut, when starting the engine. This space I covered as follows: A piece of brass tubing, ½ in. long and of a size to snugly fit the sleeve on the crank, was placed directly over the space and soldered to the sleeve. The soldered end was then filed down tapering and made smooth. —Contributed by Adolph Kline, New York City.



Lock for Sliding Doors

The sketch shows a lock for a sliding door. It consists of three pieces, a slotted bolt, A; the plate with the little block on which it rests, and the plate B. The bolt is loosely fastened in place by means of the pin C, and in such a position as to slide snugly into the socket in the wood, as indicated by the dotted lines. A feature of this lock is that it tends to prevent the door from rattling in the wind. As the door rattles, the wedge point of the bolt works its way downward until the door is held firm. —Contributed by Malcolm E. Moran, Rosario, Wash.



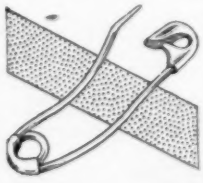
Removing a Corkscrew Attachment from a Penknife

Having a very good penknife with a corkscrew attachment, which was very much in the way, I opened up the corkscrew and cut the shank off close to the handle on the line AB, then filed the edges of the portion remaining in the handle to the shape of the sides holding it.

As I had previously spoiled a perfectly good knife by removing the corkscrew entirely, and then found I had greatly weakened the spring, I decided this time I would leave a portion of the corkscrew in the handle, which proved a success.—Contributed by James M. Kane, Doylestown, Pa.

To Prevent Safety Pin from Coming Loose

Most safety pins bend in the center when there is any strain on them, which causes the pin part to slip out of its sheath. If the pin is curved as illustrated, it cannot bend so that the pin part will slip out.—Contributed by J. Cooper Mott, Great Neck Station, Long Island.



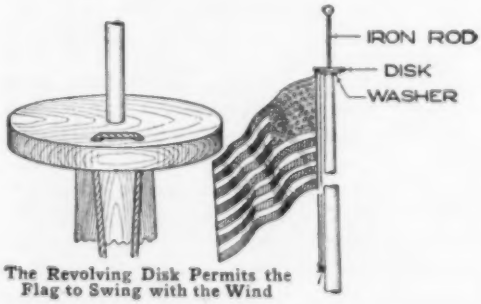
Removing Poppet Valves

The amateur motorist often finds it quite a proposition to get the valves out of an engine without removing the springs. Each valve has a groove in its upper end, and a stick can be quickly cut so that it can be driven into this

groove tightly enough to be used as a handle to pull the valve out. This method has been used with great success in removing the outlet valves of a horizontal force pump for priming, without injuring the rubber facings. A small hole, about ¼ in. deep, was drilled in the top of each valve to receive the stick.—Contributed by P. E. Riggar, Ottawa, Can.

To Prevent a Flag from Winding around the Pole

A simple and easy way to prevent a flag from becoming entangled, or winding around the pole as the wind changes, is shown in the sketch. A hardwood disk, from 4 to 6 in. in diameter, and from 1¼ to 2 in. thick, depending on the size and height of the pole, is provided with two holes near its outer edge, about 2 in. apart, with a groove cut to connect them on the upper side. A pulley may be used if a means is provided to prevent the rope from running off when it becomes slack. An iron rod is placed in the top of the pole and a washer over the rod, or if the pole end is made smooth enough the washer may be omitted. The disk is then put in place, after greasing the holes as well as the bottom surface of the groove with tallow or paraffin. The ball is placed in position and the rope run through the greased holes and groove of the disk. When the wind changes the flag acts

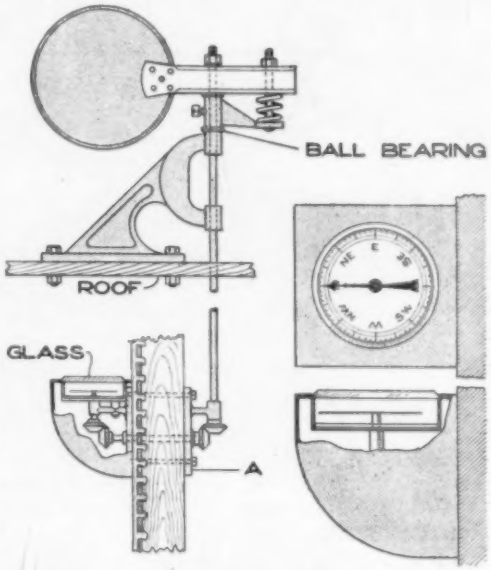


The Revolving Disk Permits the Flag to Swing with the Wind

as a weather vane, the disk revolves, and the flag is always on the side of the pole opposite to the wind.—Contributed by W. E. Day, Pittsfield, Mass.

Weather Vane with Inside Indicator

It is quite convenient to know the direction of the wind, especially in stormy weather, and as the old-fashioned vane is unsightly and altogether



A Neat Weather Vane with a Mechanically Driven Indicator in the House

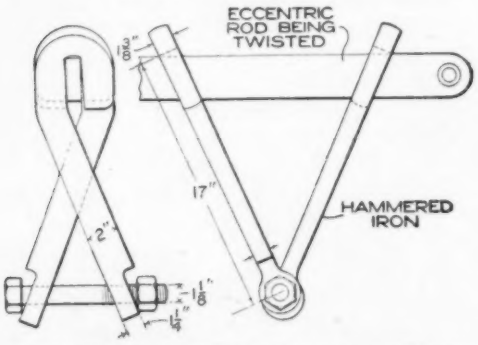
undesirable, the one shown was designed to make a neat and real ornament for any building. The design makes it easy to build, and as it has so few parts, they are not likely to get out of order.

The vane is set upon the roof by means of a bracket and is securely clamped to the vertical rod. This rod has miter gears at the lower end, where it is connected to a horizontal shaft passing through the wall, and then with another set of gears to the vertical indicator shaft. The indicator and its dial are shown in the projection.

The plate A serves as bearing for the horizontal shaft and for the lower end of the vertical shaft. The indicator should be inclosed in some neat form of a box. The coil spring in the upper part is merely a cushion and the bolt serves to hold the vane bearing horizontal.—Contributed by J. B. Murphy, Plainfield, N. J.

Twisting Locomotive Link Hangers

After repairing links and their parts, and in assembling them on a locomotive, almost always the jaws of the

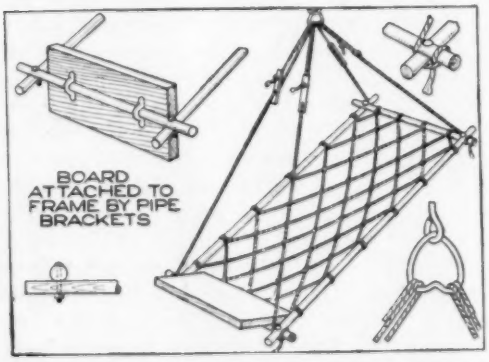


Powerful Twisting Device for Fitting Link Hangers and Eccentric Rods on Locomotives

eccentric rod will be out of line with the link, and the hanger will need a little twisting to make the parts fit properly. The sketch shows plainly a device for twisting the link hangers, and how it is used. The ends are put on the hanger from 12 to 18 in. apart, and the bolt, which is 12 in. long, is used to draw the lever arms in making the twist.—Contributed by Joseph K. Long, Renovo, Pa.

A Swinging-Chair Hammock

The illustration shows a hammock that can be used either in an upright position or at any reclining angle by simply adjusting the ropes. The space required is so small that it may be used on short porches. It gives greater comfort than the ordinary hammock, which takes up room that is not always available.



Reclining-Chair Hammock That can be Used Upright or at an Angle by Adjusting the Ropes

The cost of the hammock is very small. The frame can be made of four discarded broom handles. These are joined together in a rectangle with small bolts at the corners. The net is made of awning rope, requiring about 1 lb. of the material. If the fish-net knot cannot be tied the ordinary knot will answer the purpose.

The net soon adjusts itself to the form of the body, making the most comfortable swinging, or reclining, chair that can be had, and far superior for reading to the ordinary hammock, as the body is entirely relaxed without making it necessary for the occupant to strain the eyes in looking upward at the paper or book.—Contributed by T. F. Krey, Detroit, Michigan.

Banking Material for Pouring Babbitt

When pouring babbitt into bearings, or lead into cable fastenings, it is necessary to bank up the openings in order to confine the molten metal where it is desired. The most common material for the bank is wet clay, which can be molded into the required shape to fit the openings. A better method is to mix asbestos wool with heavy engine oil. This preparation not only serves the purpose better, but is practically indestructible. It is always ready for use, while the clay must be wetted and worked to the proper degree of plasticity each time it is used.

Waxing a Varnished Floor

A varnished floor may be waxed to save it from scratches, and the wax finish, when defaced, may be easily renovated by rubbing on more wax, or cleaned off with turpentine. Wax finish on a floor has its disadvantages, but it is easily applied and is easily renovated, besides being fit to walk upon as soon as it is applied.

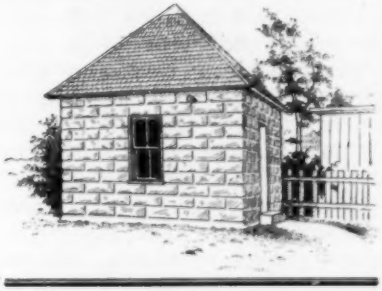
A Concrete-Block Milk House

By W. E. FRUDDEN

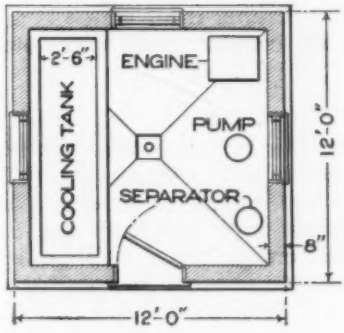
THE use of concrete in the construction of small farm buildings means the substitution of an everlasting, non-decaying type for those constantly in need of painting and repairs. Concrete construction is fire-resisting and has many other points in its favor, and has become a very popular building material among farm owners. The concrete-block milk house is most ideal. It is permanent and sanitary, and will last indefinitely. Such a structure is shown in the illustration. The one built is 12 ft. square and made entirely out of concrete, except the roof, which is of frame covered with cedar shingles. The materials for the building are as follows:

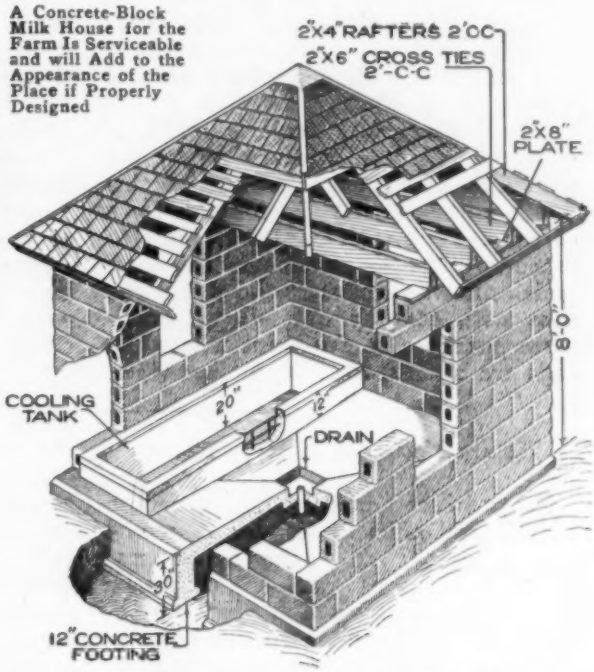
7 bbl. of cement.
3 yd. of sand.
5 yd. of screened gravel, or stone.
4 pieces for plates, 12 ft. long, by 2 by 8 in.
12 pieces for rafters, 10 ft. long, by 2 by 4 in.
7 pieces for crossties, 12 ft. long, by 2 by 6 in.
3 window frames.
1 door frame.
3 windows, 4 ft. 10 in. by 12 in.
1 door, 2 ft. 8 in. by 7 ft.
240 ft. of sheathing for the roof.
2,000 cedar shingles.
275 concrete blocks for the walls.

The building rests on a 12-in. foundation, that extends down below the frost line and is flared out at the base, as shown. Mix the concrete with 1 part cement, 3 parts sand, and 5 parts well-graded gravel, and pour into the trenches carefully so that dirt will not fall into the mixture.



A Concrete-Block Milk House for the Farm Is Serviceable and will Add to the Appearance of the Place if Properly Designed





The rules for the laying of concrete blocks, which are used in the walls, are very simple. Neat and rapid work can be done without much training. The equipment necessary is inexpensive and can be built on any farm. The things needed are a mortar-mixing box, about 3 by 5 ft.; a mortar board, about 30 in. square, made of 1-in. lumber; a trowel, a hand level, a straightedge, and a plumb board. Soak the blocks before laying them, or they will take up the moisture in the mortar and thereby weaken it. Lay the block walls up true and plumb, and in a perfect line, and test frequently to see if they are level. Good cement mortar is made in proportions of 1 part cement and 2 parts sand, mixed with enough water to make it of the required con-

sistency. Cement mortar starts to harden very quickly, and it is best to mix up small batches at a time, or enough to be used in less than one hour's time.

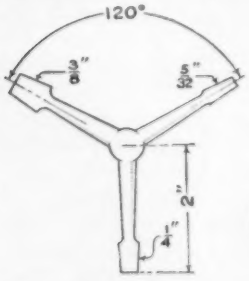
A 2 by 8-in. plate is bolted to the top course of blocks, and the roof rafters are spiked to it in a substantial manner. The rafters are 2 by 4-in. material, spaced 2 ft. from center to center, and covered with sheathing and cedar shingles, laid 4½ in. to the weather, and fastened with galvanized shingle nails.

The milk-cooling tank is made of concrete, 2½ ft. in width. Where the standard 14-in. cans are used, this width will be just right for two rows of cans. The tank used was built to extend a short distance below the floor, which allows the farm hand to lift the cans with ease by obtaining a maximum purchase at the point where the cans are hardest to raise, or just when they are leaving the water. The floor of the cooling tank is just 8 in. below the grade of the milk-house floor. The tank is 20 in. deep inside. The standard-size milk cans, when resting on the bottom of the tank, will then be surrounded by water up to their necks. The tank is made of concrete in one operation. The floor of the tank is 6 in. and the walls 4 in. thick. The concrete is reinforced with ¼-in. rods, spaced 7 in. the long way, and 12 in. the short way. The rods are bent up into the walls of the tank and are tied securely at all intersections.

Concrete for the cooling tank is mixed to a quaky consistency, using 1 part cement, 2 parts sand, and 3 parts of screened gravel, or stone. The top edge of the tank, over which the cans must be lifted, should be protected with a 4-in. channel iron, which is anchored to the concrete wall every two feet.

Handy Form for a Screwdriver

Screwdriver points of different widths and thicknesses are a necessity on many classes of work. The sketch shows how a three-pointed driver can be easily hammered out of a small piece of steel. The two points not in use furnish an excellent leverage for the work the point in use is being applied to. For a very handy little homemade tool of this nature it is hard to beat.

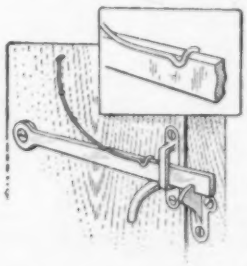


To Locate a Stud in a Partition

When it is desired to hang a heavy picture on the wall, or fasten a new shelf to it, the studs must be located in order to obtain something solid for holding the nails, or screws. The ordinary method is, of course, to sound the wall by tapping it with a hammer until the stud positions are found. If the ears are not sharp enough for this, small wire brads may be driven in at various places until the studs are located. Not many brads will be required by even the most inexperienced person, and if they are driven in all the way they will never be seen in the wall.

Spring to Hold Down Latch Bar

Annoyance by the springing open of doors having bar latches may be avoided if the device shown in the illustration is attached to the latch. A piece of spring steel, or a strong wire, is bent to exert pressure on the latch bar. The upper end of the spring or wire is fastened to the barn door with staples. The small curve where the spring and the bar connect is important in that it prevents the spring from slipping off of the bar.



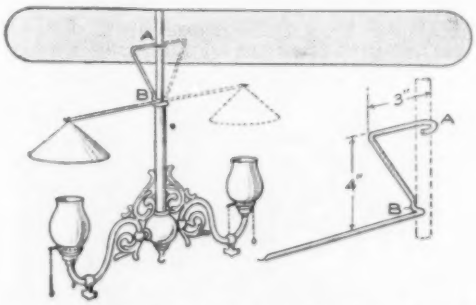
Welding Crank Cases

In accidents, automobile crank cases are often broken or cracked, and the natural desire is to have them fixed if possible. Usually the fixing takes the form of an oxyacetylene weld. Unless new factory parts are very high in price, or the break is only a minor one, or the welder is a real expert, it is a good plan to consider the cost of the welded job. Often the cylinder face has to be replaned, the main bearings rebored, the cam-shaft bearings bored, and special-size odd parts fitted. Considering all this, and the salvage from the old one, a new case is often much cheaper.

Shade Holder for a Chandelier

The shade holder shown in the sketch obviates the necessity of disfiguring the ceiling with hooks and can be applied to either light fixture. If desired a second holder may be placed on the other side.

The holder can be raised and lowered by lifting the end nearest the shade and sliding the upper loop A along the vertical pipe of the gas fixture. The weight of the shade causes the lower arm of the holder to bind against the



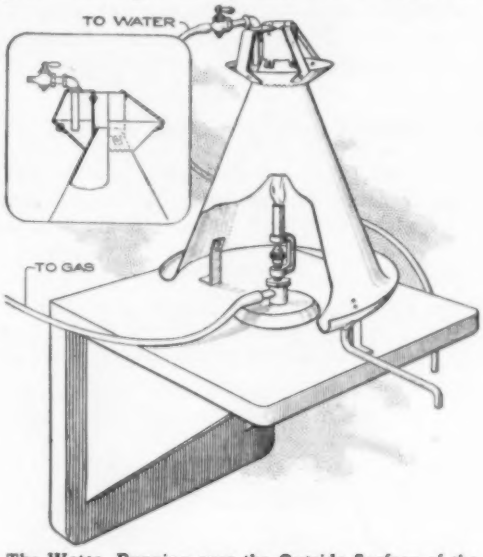
A Shade Holder Made of Heavy Wire to be Attached to the Vertical Pipe of a Gas Fixture

vertical pipe at B and prevents the device from slipping downward.—Contributed by J. A. Fitzpatrick, Altoona, Pennsylvania.

¶A cubic foot of water weighs 62.5 pounds.

An Instantaneous Water Heater

A portable water heater of my own construction and which will heat 25 gal.—enough for a bath—at a cost of



The Water, Running over the Outside Surface of the Funnel, is Heated Quickly

about one cent, is shown in the illustration.

The funnel, which is 11 in. in diameter at the widest point and 12 in. high, is made of sheet metal, riveted at the seam. The chimney at the top is 2 in. in diameter and fits over the top of the funnel, being riveted to it by straps.

Braces support the water reservoir and the water spout from the supply pipe. The view at the left shows the details of the construction at the top.

Instead of the Bunsen burner shown, the fixture from an ordinary mantle gas light may be used, by removing the mantle and adjusting the small collar through which the air supply is received. A steady blue flame will give more heat than a yellow flame.

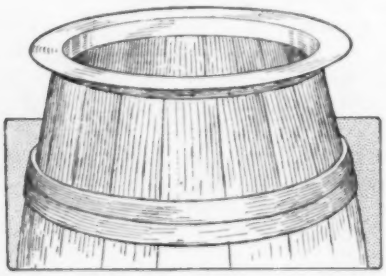
The heater may be transported to any part of the house where a gas supply is available. If necessary, a water bucket may be set high enough so that water may be supplied through the tube in this manner. Care must be taken that the rubber or other tubes used fit tightly over the nipples, and for purposes of safety, a piece of asbes-

tos or sheet metal should be placed under the heater.

The supply of water should be carefully adjusted in order that only as much as can be heated properly is permitted to flow over the funnel, and the reservoir is not overflowed.—Contributed by James E. Noble, Toronto, Can.

Nail Guard for Open Barrels

In stores and factories where material must be scooped by hand from barrels a nail guard saves a great deal



Guard for a Barrel Top to Prevent Injury on the Projecting Nail Points

of time. When the barrels are opened there are so many nails around the upper edge and they are so troublesome to remove that the workman usually allows them to remain. The scooping is then done with such care to avoid injury that an unnecessary amount of time is consumed. A simple guard made of sheet metal, as shown in the sketch, permits the barrel to be emptied quickly.

Preparing New Surfaces of Galvanized Iron for Painting

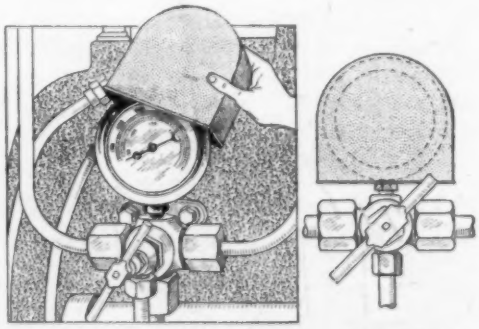
New galvanized iron needs to be treated before painting, otherwise the paint will peel. There are a few ways of doing this, but the simplest, and one of the best, is to apply a coating of iron acetate, which is vinegar that has surrounded iron for a time. A coat of this will do the trick. Another method is to give the surface a coat of equal parts of spar varnish and turpentine. The government specifies sponging the surface with strong vinegar, which is also a sure method.

Starting Piston Rings in a Cylinder

In overhauling a four-cylinder motor recently, I had considerable trouble in getting the piston rings back in place. The cylinders, being cast in pairs, were quite heavy and hard to handle, and all the twisting and wriggling possible would not let them enter, and the rings, which were of the leak-proof kind, refused to close in by hand. I hit on the idea of taking a piece of pasteboard, about 2 in. wide and long enough to reach around the piston, and tying it tightly in place with a stout cord. By lifting the cylinders over the pistons and letting them enter, the weight was sufficient to push the pasteboard down, at the same time keeping the rings closed so that they would enter. Considerable time was lost before this idea was tried out, but with its aid the job was completed in 10 minutes.—Contributed by A. Dane, Pottstown, Pa.

Protection Hood for Pressure-Ram Indicator Gauges

Pressure gauges on hydraulic rams of almost any make are frequently broken, even though the workmen are careful in handling the material brought into place for the action of the ram. Accidents are not uncommon as a result of the pieces, swung by the cranes into the ram blocks, coming into



Covering to Protect the Gauge on a Pressure Ram

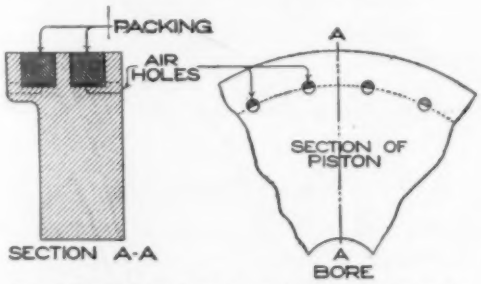
contact with the glass dial cover of the gauge.

The illustration shows a safety hood of the type adaptable for almost any

kind of gauge located in connection with a pressure of a hydraulic press. The hood is removed only when the gauge is in actual use for controlling the action of the ram, and is replaced when the pressure is removed. In this manner not only are workmen protected against injury from flying splintered glass, but the gauge itself is safeguarded.—Contributed by F. W. Bentley, Missouri Valley, Iowa.

Air-Cylinder Packing to Prevent Leaks

Hemp, or flax, packing is most generally used in air cylinders in preference to iron rings. The iron rings will rust and cause them to cut the cylinder, which will soon make them leak. The sketch shows the proper way in which to fit hemp packing. Holes are drilled at the base of the packing so that half of their diameters will be in the packing groove. The holes allow the air to get under the packing, which forces them against the cylinder walls. Rings packed in this way will wear longer, make a tight fit, and give no trouble.

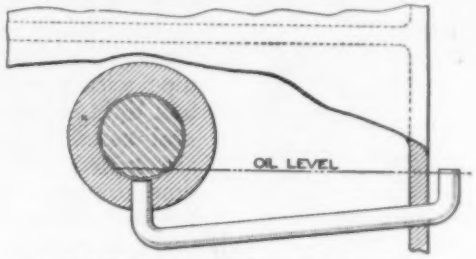


The Drilled Holes Permit the Air to Pass under the Rings and Push Them Out

Oiling Inaccessible Bearings

Lubrication of bearings which are ordinarily inaccessible may be accomplished by application of the principle that liquids tend to seek their own level.

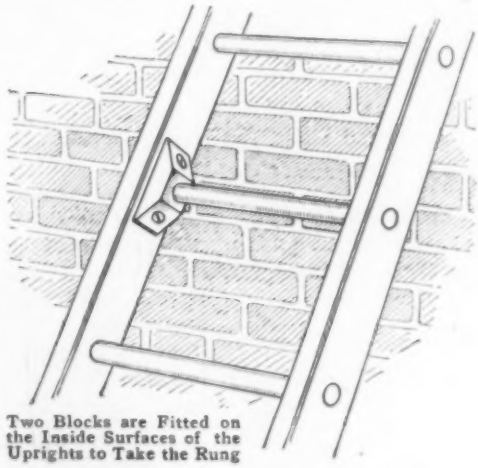
The illustration shows a shaft bearing housed in a cast-iron frame into which an oilcan, no matter how long the spout, cannot reach. A hole was drilled in the bottom of the bearing and one of the same size was drilled in the frame. A tube was fitted into the openings and the outer end of it cut off slightly above the level of the oil in the bearing. This level must be determined in order that a proper quantity of oil may be supplied. By filling the outer portion of the tube to the top, the oil will find its level at the desired point, lubricating the bearing.—Contributed by Frank H. Mayoh, Pawtucket, R. I.



The Oil will Seek Its Level and Lubricate the Bearing

Replacing a Broken Rung in a Ladder

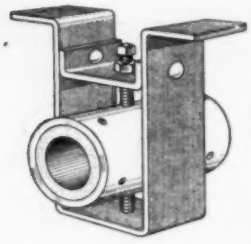
When a rung breaks in a ladder, do not nail a board across the front edges of the uprights, but make the repair as shown in the illustration. A new rung is made having a length to fit snugly between the side rails or uprights. Two blocks are bored to fit the ends of the rung and they are fastened to the side rails with screws. This does not make an unsightly repair and the ladder will be as good as new.



Two Blocks are Fitted on the Inside Surfaces of the Uprights to Take the Rung

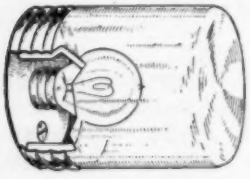
Homemade Flexible-Shaft Hanger

An improvised flexible-shaft hanger is shown in the illustration. The bearing is made from a piece of wrought-iron pipe with a babbitt lining. Several small holes are drilled in the pipe previous to the babbitting to serve as anchors for the lining. The flexibility is secured by supporting the bearing between the ends of two round-point setscrews. The sockets in the pipe for receiving the setscrew ends are merely shallow holes made with a large drill. The frame is formed from flat bar steel.



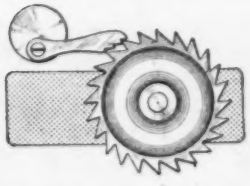
A Temporary Automobile Light

During my vacation I broke the globe on one of my automobile side lights. A cold-cream jar and cover, however, was all that was necessary until I reached the city again. A tobacco jar will answer the same purpose.—Contributed by J. F. Southwell, Lynn, Mass..



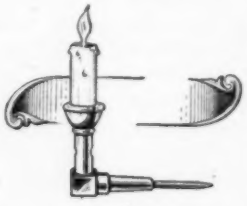
Toothed Pawl for Removing Lost Motion

Sometimes when a ratchet wheel is actuated by a pawl it will stop because of the irregularity of its teeth. If the space between any two teeth happens to be longer than the working stroke of the pawl, the reciprocating movement of the latter will not be sufficient to enable the pawl to pass over the tooth point where it will engage the next tooth. By filing several small teeth in the working face of the pawl this difficulty is overcome, as there is always one pawl tooth in position to engage a ratchet tooth. Care must be taken in proportioning the pawl teeth in order to insure one full tooth movement on the ratchet for each reciprocation of the pawl.



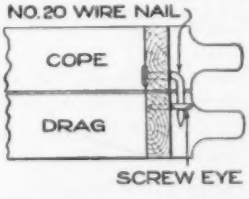
An Improvised Candle Holder

Not having any connection for gas or electric light in a small, dark room, the ingenious owner made a serviceable candle holder of a discarded gas jet cock. The candle was inserted into the threaded socket to which the gas pipe was connected. A heavy wire was sharpened and formed into a spike by which the holder was stuck firmly to the wall.

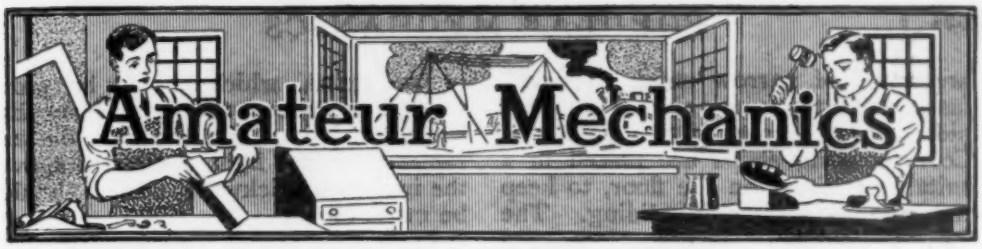


Foundry-Flask Pins

Receiving a rush order for 40 small castings, I was obliged to construct a few flasks, the castings being too large for the snap flasks on hand. How the flask pins were made in a hurry is shown in the illustration. A common 20-penny wire nail was driven in the end piece of the flask and bent at right angles to fit in a large screw eye. This made a simple pin that answered the purpose well.—Contributed by M. Johnson, Kenosha, Wisconsin.



¶In jointing boards for a glue joint, white crayon rubbed on the edge of one of the boards will make impressions on the other, thus fixing the high points.



Fireside Dissolving Views

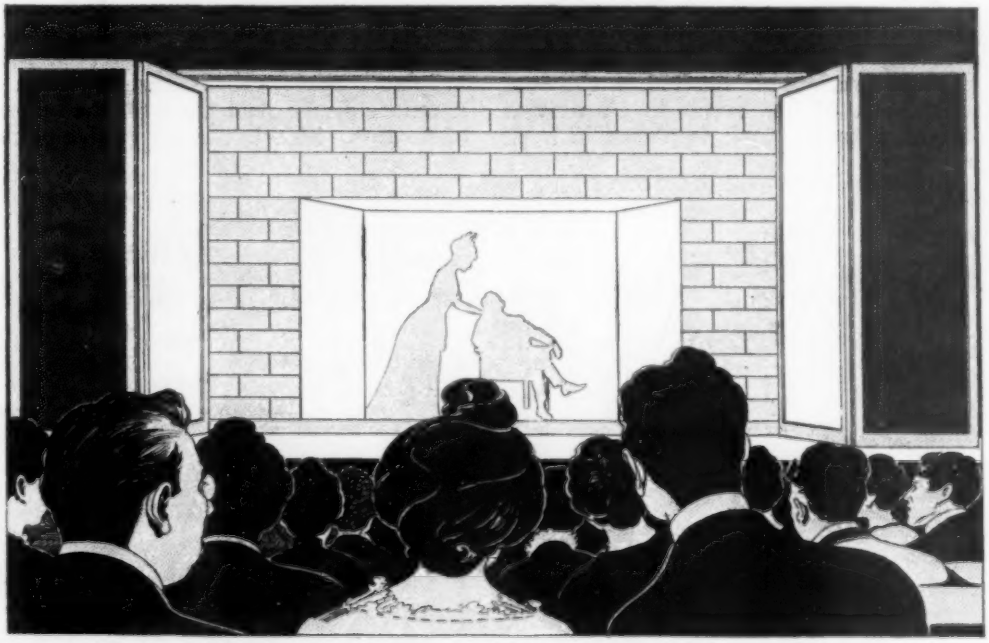
By SUSAN E. W. JOCELYN

TO those interested in amateur theatricals the following method of showing dissolving views in the firelight of pipe dreams and mind pictures will be appreciated.

A frame made of light material, A, Fig. 1, covered with red cloth and chalked to represent brick, is placed in the center of the stage. The central opening, representing the fireplace, must be rather large, about 12 ft. wide and 7 ft. high, because it is at the back of this opening that the pictures are produced. From the chimney back, 2½ ft. behind this opening, the sides, B, of the fireplace slope outward to the imitation brickwork. The walls of the fireplace are covered with sheet asbestos, for safety, and painted black; then ashes are rubbed on the chimney back and scattered over the hearthstone, to make the appearance more realistic.

The chimney back is removable, in fact it is one of a series of a half dozen screens, the others being behind it, the proper manipulation of which, together with changing lights, gives to the audience the effect of dissolving views of the dreams that are being acted out directly behind the screens.

The screens are carried in a light frame, the top of which is shown in Fig. 2, with position of runs. The runs



The Tableau is Played Out behind the Screens and is Dimly Seen through the Fireplace Opening When the Lights are Properly Controlled and the Screens Drawn Slowly

are made of narrow strips of wood, fastened to the under side of two end pieces, for the screen frames to slide in. Corresponding strips are placed in a suitable position on the floor, to keep the screens steady in sliding. The frames holding the run pieces are longer than the chimney back is wide, and the upper one is placed as high as the brickwork, the shelf, or mantel, over the fireplace being an extension of the upper part, or frame. The screens are in pairs, as shown in Fig. 3, each one extending to the center of the fireplace. They consist of light frames covered with black mosquito netting. The upper and lower sides of the frames are sandpapered smooth so that they will move easily in the runs. The vertical sides of a pair of screen frames that meet in the center of the fireplace are made of one strand of wire, instead of wood, so that their motion will not be noticeable. To complete the apparatus, andirons and a gas log are needed in the fireplace, and whatever arrangements are necessary for the action of the views to be shown behind the screens.

If gas is available, an asbestos log is used in the fireplace, and it has a connecting pipe to the footlights, where four or five jets are located on the floor just back of the screens. A narrow board, painted black, is placed in front of the lights, which should be wide enough to conceal the lights from the spectators and reflect the light on the tableau. If the light is thrown above the imitation brickwork, then it should be made higher.

In most halls, and some houses, electric lights are used instead of gas, and in this case ordinary logs are piled in the fireplace on the andirons, and one or more red globes are introduced to produce the effect of glowing embers. The gas is more effective, however, because it is not easy to get a gradual rise and fall in the glow of electric lights. Four or five footlights are sufficient.

The working of the dissolving views can be best explained by an illustration from "Reveries of a Bachelor." The gas log is turned low to make the stage dimly lighted, and the tableau to be shown is all arranged behind the chimney back and the screens. There should be barely sufficient light to reveal the bachelor on the hearthstone smoking in the gloaming. Then the chimney back almost imperceptibly parts, that is, the screens of the first pair are gradually pulled apart, the footlights and gas log are gradually turned on, and the tableau behind the fireplace, being more brightly illuminated, is dimly seen through the series of screens. Slowly the successive pairs

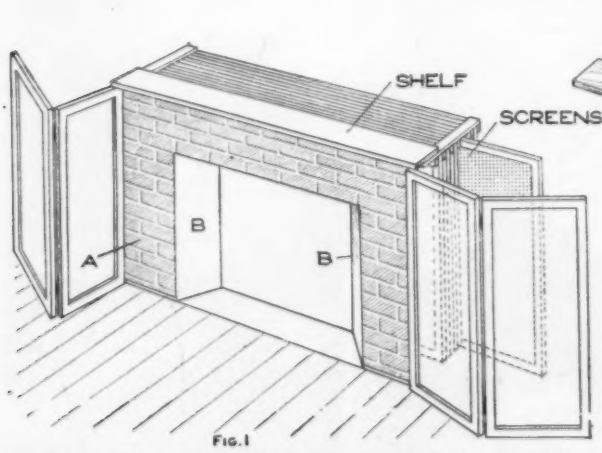


FIG. 1

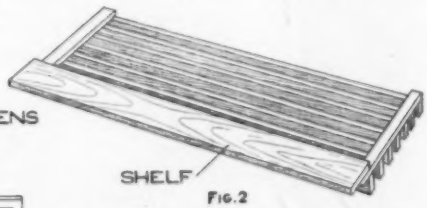


FIG. 2

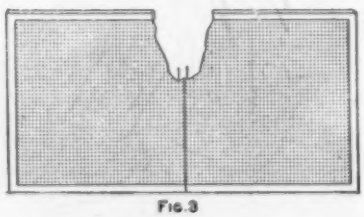


FIG. 3

Frames Made of Light Material and Covered with Black Mosquito Netting Serve as Screens Which are Operated in Runs Located behind the Fireplace That is Made Up in a Like Manner and Penciled to Represent Brick

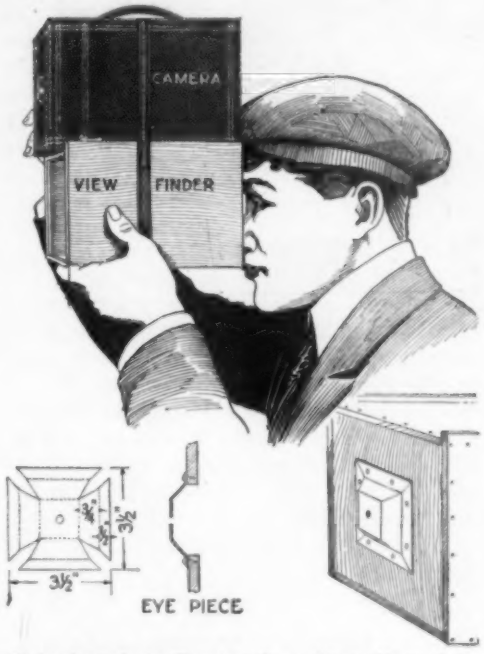
of screens are drawn aside, and the tableau becomes quite distinct. Then the process is reversed, the screens are gradually replaced, the lights are lowered and the dream fades away; brightens and fades again; brightens and fades, till gone entirely. The screens are always slowly moving while the tableau is exposed, and this makes the illusory effect. It is evident that the success of this plan depends principally on the coördination with which the screens are operated. "Cinderella," and many other tales based on the vagaries of the mind and having their source in glowing embers, can thus be presented.

Imitation-Celluloid Scales and Name Plates

Often the amateur turns out a very workmanlike piece of apparatus, which only lacks the addition of a scale or name plate to give it a truly professional appearance. I recently hit upon an excellent method of making these articles in a manner that will stand considerable wear and at the same time present a very good appearance. Simply take a piece of good Bristol board and letter it as desired with waterproof drawing ink, then apply a coat of clear varnish, such as is used on bird's-eye maple furniture. After not less than 24 hours rub lightly with fine steel wool, wipe clean, and revarnish. Usually two coats are sufficient, and the last should be rubbed with a soft oily rag dipped in some abrasive material such as tooth powder, or one of the many powders used for metal polishing. Finally polish with a little oil, and the result will be a perfect imitation of celluloid.—Contributed by John D. Adams, Phoenix, Ariz.

Direct View Finder for a Box Camera

Disappointment in the taking of pictures with a small camera is often caused by the inability of the photographer to obtain an accurate view of what he is photographing. If, instead of the small view finder on the camera, the device illustrated is used, a view of the resultant photograph may be obtained, right side up, and of nearly the same size as the finished print.



Sight through the Eyepiece for a Direct View of the Object Photographed, Thus Insuring More Nearly the Accuracy of the Result

The distance from the lens of the camera to the front surface of the plate or film must be determined. In the camera shown this was 4½ in. The distance from the small metal eyepiece, when it is in place on the box, to the inner side of the opposite end of the box must be made ½ in. shorter than this measurement. This will cause the box to be shorter than the camera.

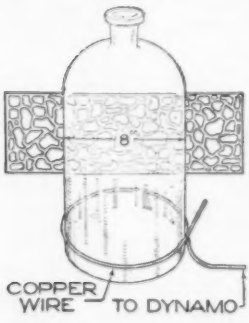
The box is constructed so that the sides extend above the top and engage the camera. The view-finder eyepiece is made from a flat piece of sheet metal, laid out as shown, and bent into the desired shape. It is fixed over the center of the end of the box. The sight hole must be 1/32 in. in diameter. By sighting through the small opening in the eyepiece an unobstructed view of the prospective photograph is obtained. —Contributed by A. S. Thomas, Amherstburg, Ont.

A Match-Box Trick

All that is required to perform this trick is a box of safety matches. Four matches are removed and three of them arranged as shown in the sketch. The performer then tells his friends that he will light the fourth match and set the cross match on fire in the center, then asks which match of the standing ones will light first. Most persons will not stop to think and guess either one or the other. As a matter of fact, after the cross match is set on fire it soon burns the wood away, and the pressure of the two side matches will cause it to spring out so that neither catches fire.—Contributed by Abner B. Shaw, North Dartmouth, Massachusetts.

Cutting Glass Bottle with Electricity

Performing an experiment in a laboratory, it became necessary to have some apparatus which we did not possess at the time. A bell jar could have been used, but this we did not have, and as a substitute we used a large glass bottle, 8 in. in diameter, with the bottom removed. In order to do this, we first made a mark around the outside of the bottle near the bottom with a glass cutter. A piece of copper wire, 1/32 in. in diameter, was then wound around the outside on the mark and connected to the circuit.

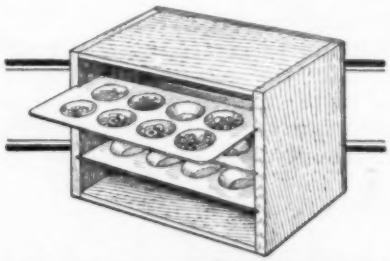


As the wire would expand enough to make it slip off the bottle when heated red-hot, pliers were used to keep it taut about the bottle when the current was turned on. A current of 110 volts and 5 amperes was run through the wire, heating it red-hot, and this cracked the glass exactly on the line marked by the glass cutter.—Contributed by R. E. Hollis, Chicago, Ill.

Nail Cabinet with Muffin-Pan Trays

Muffin-pan trays used by the housewife in baking make serviceable containers for nails, screws, and other small articles used in a shop. The illustration shows the pans fitted into a box, and sliding in grooves cut into the sides with a saw.

The box is made with the end pieces lapping over the top and the bottom, this being a better construction to carry the weight of the trays. The wood used in the sides is 7/8 in. thick, in order that a saw cut may be made to a depth of 1/4 in. without weakening the support. Thinner wood may be used if instead of saw cuts small strips of wood are nailed against the side on which the trays may slide.—Contributed by Harry J. Blacklidge, San Rafael, Cal.

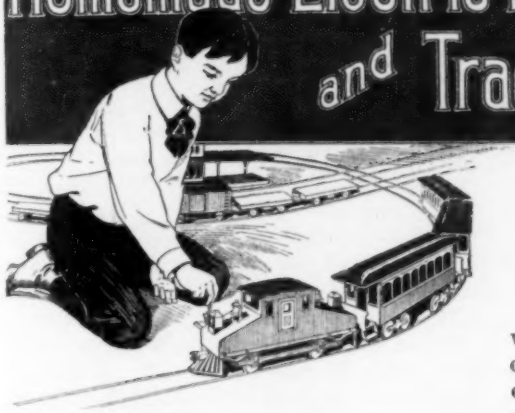


The Metal Trays Are Substantial and may be Removed Readily for Use Elsewhere

Waterproofing Matches

Dipping ordinary parlor matches into melted paraffin and permitting them to dry thoroughly will enable them to withstand water. The paraffin acts like a wax candle and is unaffected by the moisture. This should be of aid to campers and others who find it hard to keep matches dry.—Contributed by J. W. Lambert, Jr., New York, N. Y.

Homemade Electric Locomotive Model and Track System



By A. E. ANDREW

PART I—The Motor

THE electric locomotive described may be constructed by boys having average mechanical ability and the necessary tools. However, in any piece of mechanical construction care must be taken to follow the instructions. The material required is inexpensive, and the pleasure derived from such a toy is well worth the time used in its construction.

The making of the outfit may be divided into three parts, the first of which is the motor; second, the truck, which is to carry the motor and the body of the car, and third, the track system upon which the engine is to operate. A side view of the locomotive is shown in Fig. 1.

The motor is of the series type, having its field and armature terminals connected to the source of electrical energy through a special reversing switch. By this means the rotation of the armature may be reversed to make the locomotive travel forward or backward. The armature and field are constructed of sheet-iron stampings, riveted together.

The detailed construction of the armature and its dimensions are shown in Fig. 2. The shaft upon which the armature core and commutator are to be rigidly mounted is made of a piece of steel rod, $\frac{7}{32}$ in. in diameter. A portion of this rod, $2\frac{1}{4}$ in. long, is threaded with a fine thread, and two small brass, or iron, nuts are provided to fit it. The ends of the rod are turned down to a diameter of $\frac{1}{8}$ in. for a distance of $\frac{1}{8}$ in. These are to fit in the bearings that are to be made later.

Cut from thin sheet iron a sufficient number of disks, $1\frac{1}{8}$ in. in diameter, to make a pile exactly $\frac{5}{8}$ in. thick when they are securely clamped together. Drill a hole in the center of each of these disks, of such a size that they will slip on the shaft snugly. Remove the rough edges from the disks and see that they are flat. Cut two disks of the same size, from a piece of $\frac{1}{16}$-in. spring brass, and drill a hole in the center of each, so that they will slip on the shaft. Place all these disks on the shaft, with the brass ones on the outside, and draw them up tightly with the nuts provided. Be sure to get the laminated core in the proper position on the shaft by observing the dimensions given in the illustration, Fig. 2.

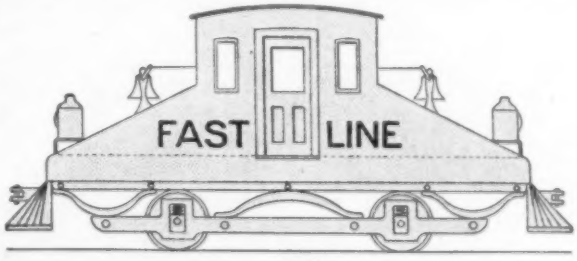


FIG. 1
Side View of a Locomotive Designed to be Operated with Either End Forward

After the disks have been fastened, clamp the shaft in the chuck of a lathe and turn down the edges of all the disks so that they form a smooth

cylinder, 1 1/16 in. in diameter. Draw a circle on the side of one of the brass disks, 3/32 in. from the edge, while the shaft is held in the chuck. Divide this circle into eight equal parts and make a center-punch mark at each division. Drill eight holes through the core lengthwise with a 3/16-in. drill. If the centers of the holes have been properly located, all the metal on the outside will be cut away, as shown in the end view, at the right in Fig. 2. The width of the gaps, F, G, H, etc., thus formed, should be about 1/16 in. Smooth off all the edges with a fine file after the holes are drilled.

A cross-sectional view of the commutator is shown at the extreme left, Fig. 2. It is constructed as follows: Take a rod of copper or brass, 7/8 in. in diameter, and 1 1/4 in. long; clamp one end in the chuck of a lathe. Turn the other end down to a diameter of 3/4 in., and drill a 1/2-in. hole through it at the center. Cut away the metal from the end to form a disklike recess.

Cut off a disk, 5/16 in. thick, measuring from the finished end, from the piece of stock. Place this disk in a chuck, with the unfinished end exposed, and cut away the metal in a dish form, as shown at B. Cut small slots, into which the ends of the wires used in winding are to be soldered, as shown at 1, 2, 3, etc., in the right-hand view of Fig. 2. Obtain two brass nuts, about 1/4 in. in thickness, and turn their edges down so that they correspond in form to those shown at C and D. Divide the disk ring, just made, into eight equal parts, by lines drawn across it through the center. Cut eight slots at these points, in the rim of the disk. These cuts should be through the rim. Fill each of the slots with a piece of mica insulation.

Place one of the nuts on the shaft, and then a washer of mica insulation, shown by the heavy lines, near A and B; then the ring, a second piece of mica, and last the nut, C. The latter should be drawn up tightly, so that the insulation in the slots in the disk are opposite the drilled slots in the armature core, as shown in the right-hand view of Fig. 2. After the disk has been fastened securely, test it to learn whether it is insulated from the shaft. This is done by means of a battery and bell, connected in series, one terminal of the circuit being connected to the disk, and the other to the shaft. If the bell rings when these connections are made, the ring and shaft are not insulated. The disk must then be remounted, using new washers of mica insulation. Mica is used because of its ability to withstand a higher degree of heat than most other forms of insulation.

Each of the eight segments of the dished disk should be insulated from the others. Make a test to see if the adjacent commutator segments are insulated from each other, and also from the shaft. If the test indicates that any segment is electrically connected to another, or to the shaft, the commutator must be dismantled, and the trouble corrected.

The armature is now ready to be wound. Procure 1/8 lb. of No. 26 gauge insulated copper wire. Insulate the shaft, at E, with several turns of thin

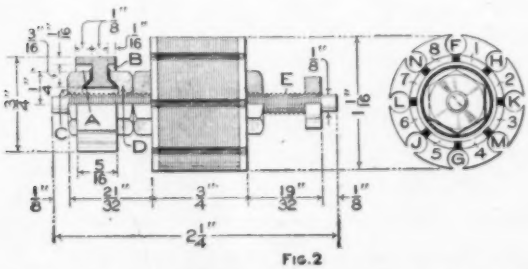


FIG. 2

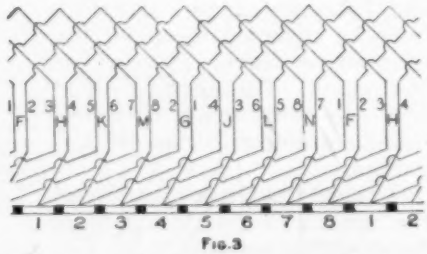


FIG. 3

How the Armature Core is Made of Soft-Iron Disks for the Lamination, at the Left. Diagram for the Winding of the Armature Coils and Their Connection to the Commutator, at the Right

cloth insulation, and also insulate similarly the nuts holding the armature core and the inside nut holding the commutator. Cut several pieces from the cloth insulation, wide enough to cover the walls of the slots in the core, and long enough to extend at least 1/16 in. beyond the core at the ends. Insulate slots F and G thus, and wind 15 turns of the wire around the core lengthwise, passing the wire back through the slot F, across the back end of the core, then toward the front end through slot G, and back through F, and so on. About 2 in. of free wire should be provided at each end of the coils.

In passing across the ends of the armature, all the turns are placed on one side of the shaft, and so as to pass on the left side, the armature being viewed from the commutator end. The second coil, which is wound in the same grooves, is then passed on the right of the end of the commutator shaft. After this coil is completed test it to see if it is connected to the armature core. If such a condition is found, the coil must be rewound. If the insulation is good, wind the second coil, which is wound in the same slots, F and G, and composed of the same number of turns. Insulate the slots H and J, and wind two coils of 15 turns each in them, observing the same precautions as with the first two coils. The fifth and sixth coils are placed in slots K and L, and the seventh and eighth, in slots M and N.

The arrangement of the half coils, slots, and commutator segments is given in detail in Fig. 3. Each coil is reduced to one turn in the illustration, in order to simplify it. From an inspection of this diagram it may be seen that the outside end of the second coil in the upper row of figures, at the left end, is connected to the inside end of the fourth coil at segment 1, in the lower row of figures, representing the segments of the commutator. The outside end of the fourth coil is connected with the inside end of the sixth coil, at segment 2; the outside end of the sixth coil is connected with the inside end of the eighth coil at segment 3; the outside end of the eighth coil is connected to the inside end of the coil 1 at segment 4; the outside end of the coil 1 is connected to the inside end of the coil 3 at segment 5; the outside

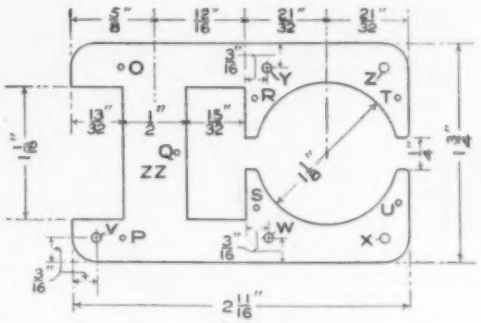


FIG. 4

Pattern for the Field Stampings, Several Pieces being Used to Make the Desired Thickness

end of the third coil is connected to the inside end of the fifth coil at segment 6; the outside end of the fifth coil is connected to the inside end of the seventh coil at segment 7; the outside end of the seventh coil is connected to the inside end of the second coil at segment 8, and the outside end of the second coil is connected to segment 1, completing the circuit.

In winding the coils on the core, their ends should be terminated close to the commutator segments to which they are to be connected, in order to simplify the end connections. After all the coils are wound and properly tested, their ends may be connected as indicated. They are then soldered into the slots in the ends of the commutator segments. The completed winding is given a coating of shellac.

The dimensions and form of the field stampings are given in Fig. 4. A number of these cut from thin sheet iron to make a pile 5/8 in. thick when clamped together is needed. The dimensions of the opening to carry the armature should be a little less than that indicated in the sketch, as it will be necessary to true it up after the stampings are fastened together. Use one of the stampings as a pattern, and drill seven small holes in each, as indicated by the

letters O, P, Q, R, S, T, and U. Fasten them together with small rivets, and true up the opening for the armature to a diameter of 1⅛ in. Drill five ⅛-in. holes, as indicated by the letters

Now cut two pieces from 1/16-in. sheet brass, similar to those shown in Fig. 5. Place them on opposite sides of the laminated field structure, shown in Fig. 4, and carefully mark the position

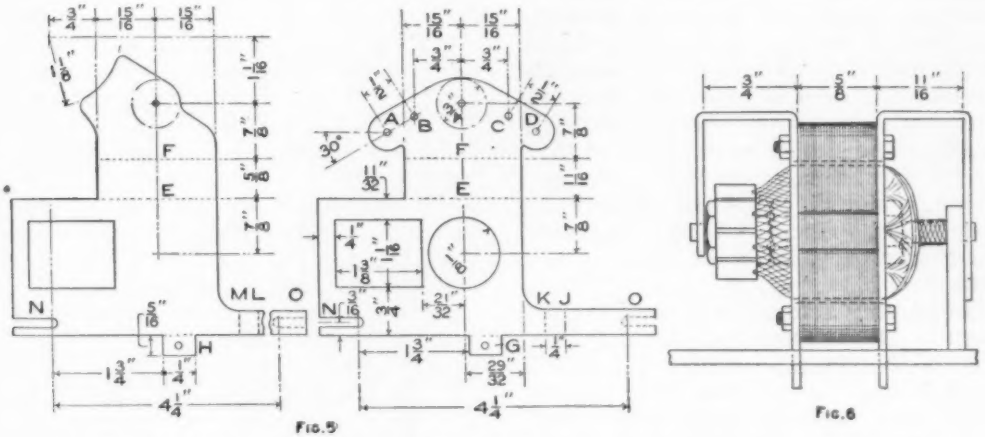


Fig. 5

Fig. 6

Detail of the Field-Structure Supports, One Being for the Left Side and the Other for the Right. The Supports are Shown in Place at the Right

V, W, X, Y, and Z, to be used in mounting the pieces, which are to form the armature bearings, brush supports, and base of the motor.

Cut two rectangular washers from a piece of thin fiber insulation, with outside dimensions of 1⅛ in. and 1¼ in., and an inside opening, ½ in. by ⅝ in. Cut open these washers and slip them in position on the portion of the field marked ZZ. Wrap two turns of the cloth insulation about this part, which is to form the field core, and wind the space full of No. 18 gauge enamel-

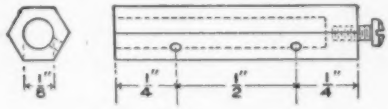


Fig. 7

Detail of the Brush Holders, One Inch Long, with Holes as Shown

insulated copper wire. Give the completed winding a coat of shellac. The terminals of this winding should be brought out through two holes drilled in one of the fiber washers, one near the core and the other near the outer edge. It is better to have the field terminals at the lower end of the part ZZ than at the upper end.

of the holes, V, W, X, Y, and Z, as indicated in Fig. 4, and drill ⅛-in. holes, where the marks were made. Lay out and drill ⅛-in. holes, A, B, C, and D, Fig. 5. Bend the upper portion of the pieces at right angles to the lower portion, along the dotted lines E, and then bend the end of the horizontal portions down along the dotted lines F, until they are parallel with the main vertical parts of the pieces. The latter should be bent so that one forms the left support and the other the right, as shown in Fig. 6.

Bend the projections G and H at right angles to the vertical main parts. The parts at the bottom are bent, one back along the dotted line J and forward on the line K; the other forward on the line L and back on the line M. The pieces are then mounted, on the side of the field structure, as shown in Fig. 6. The supports are fastened in place with five small bolts. The grooves N and O, in Fig. 5, are used in mounting the motor on the axles of the truck. They will not be cut until after the truck is constructed.

The brush holders are made of two pieces of hexagonal brass, each 1 in. in

length, having a ⅛-in. hole drilled in one end to a depth of ⅞ in., and a threaded hole in the other end, for a small machine screw, as shown in Fig. 7. Two holes are drilled and threaded in one side of each of these pieces. These holders are to be mounted, by means of screws, through the holes A, B, C, and D, Fig. 5. Each holder must be insulated from its support. The distance of the holder from its support should be such that the opening in its end is in the center of the commutator. The brushes are made of very fine copper gauze, rolled to form a rod. They are made long enough to extend about ½ in. into the holder, when they are resting on the commutator. A small spiral spring is placed in the holder, back of the end of the brush, and which will serve to keep the latter in contact with the commutator.

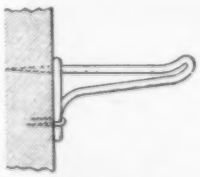
Temporary connections are made and the motor is tested with a six-volt battery. The construction of the motor may be modified as to the length of shaft, and other minor details, and may be used for other purposes by fitting it with pulleys, a countershaft, or other transmission devices.

Making String Solder

String solder of a size convenient for electrical work, or other soldering, where only a small quantity is desired, may be made by adapting a ladle for the purpose. Drill a small hole through the ladle near its upper edge. Melt the solder and pour it through the small hole, permitting it to fall on a slab of marble, slate, or stone. The ladle must be moved in zigzag lines in order to prevent the string from crossing and to make it possible to roll up the solder into rings of a convenient size.—Contributed by L. E. Fetter, Portsmouth, N. H.

To Prevent Wire Coat Hook from Turning

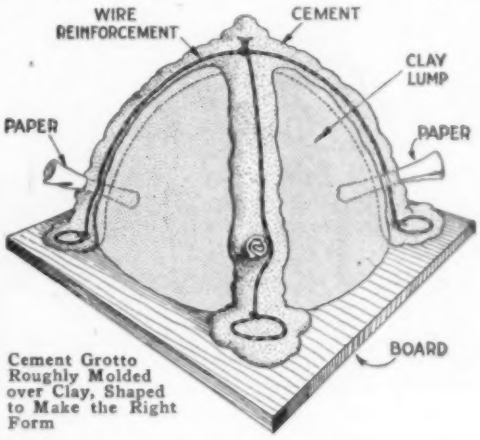
A good way to keep a common wire coat hook in an upright position is to drive a small wire staple over the smaller hook. In public places, such as halls, this will often prevent their removal and save considerable annoyance.—Contributed by Harry L. Dixson, Chicago, Ill.



¶The second coat of varnish should never be put on until the first has been "mossed" (rubbed) off; as, otherwise, it will not stick well.

Cement Grotto for an Aquarium

To build a small cement grotto for an aquarium, make a clay mold by roughly excavating two right-angled gutters in a lump of clay. Grease, or shellac, the mold after it is dry. Apply cement of about the consistency of putty, or dough, filling the gutters roughly so as to give a rocklike finish. Small shells can be stuck into the cement while it is yet moist. Before entirely shaping the cement, a piece of heavy wire is bent to conform to the shape of the grotto and set in for a reinforcement.



Cement Grotto Roughly Molded over Clay, Shaped to Make the Right Form

Holes can be made by twisting paper, so that it will extend out at each side, and laying cement over it. After the cement is thoroughly dry, the paper can be removed in sections.

Focusing Screen for Enlarging Cameras

It is often very difficult when focusing an enlarging camera to determine just when the perfect focus is reached, especially when the negative is dim and without contrasting lights and shades. This difficulty may be overcome and a perfect focus quickly determined by the use of a focusing screen prepared as follows: Take a clear film or plate, one that has been fixed without being exposed, and when dry, rule lines on it with India ink to form small squares. To make the ink adhere to the film, dust the latter with talcum powder.

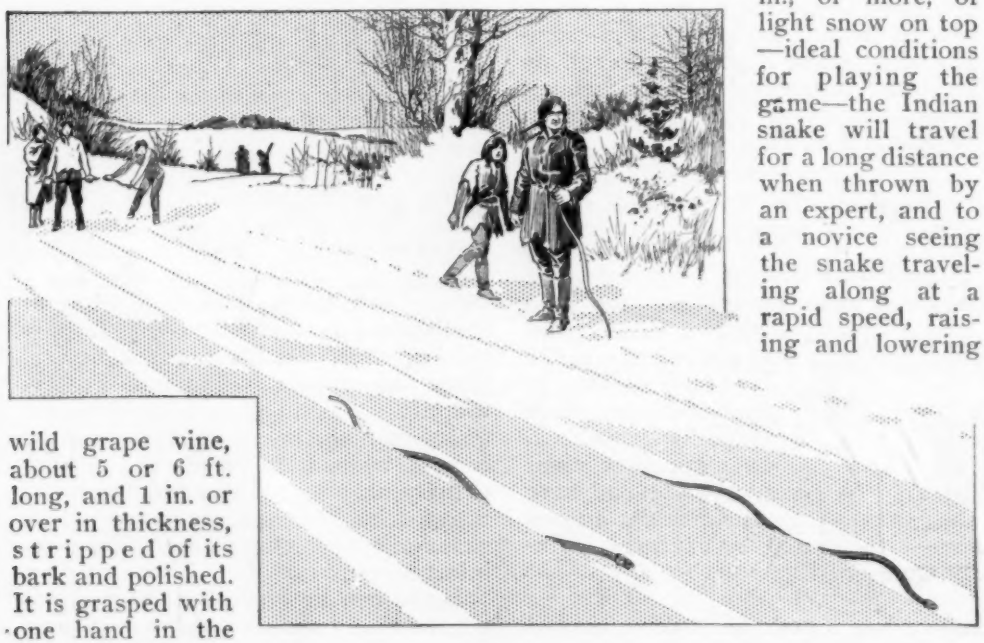
To use the screen, slide the film to be enlarged in place and set it for the size of enlargement, focusing roughly. Remove the film or plate and put the screen in its place. The camera may now be brought to a perfect focus with ease, as the black lines show up sharp and clear on the screen. When the focus has been determined the screen is removed and the film replaced.

The squares may be drawn from ¼-in. size down to the smallest it is possible to make. For large views it is easier to focus with the smaller squares. If the squares are made to a certain size they can be measured when thrown on the screen and the degree of enlargement determined.—Contributed by R. H. Galbreath, Denver, Colorado.

¶The longitudinal carriage handle should never be held in the hand when cutting threads.

An Indian Snake Game

Ask any Canadian Indian what a snow snake is, and he will tell you that it is a piece of twisted wood, such as a wild grape vine, about 5 or 6 ft. long, and 1 in. or over in thickness, stripped of its bark and polished. It is grasped with one hand in the center and given a strong forward throw at the tail end by the other hand, while at the same time the hold in the center is loosened. With a hard bottom and about 1 in., or more, of light snow on top—ideal conditions for playing the game—the Indian snake will travel for a long distance when thrown by an expert, and to a novice seeing the snake traveling along at a rapid speed, raising and lowering



Throwing the Snow Snake in Tracks Made through the Snow with a Log: Each Player Tries to Get His Snake First Out at the End of the Track More Times Than His Opponents

its head as the wood vibrates from side to side, its resemblance to the real reptile is perfect.

When the Indians have tests of skill with the snake they make tracks through the snow by drawing a log in it, and sometimes as many as a dozen tracks are made side by side, and a dozen snakes are sent along at once. The one who makes his snake emerge from the end of the track first the most times out of a certain number of throws, takes the prize. The trick of throwing the snake is not at all hard to acquire, and it makes an exciting game.—J. E. Noble, Toronto, Can.

Storage of Wood for Cabinetwork

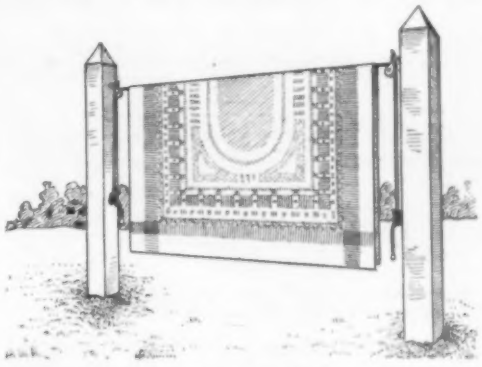
When working with wood to be made into furniture, or other constructions of a high grade of workmanship, the ends of the finished pieces should be shellacked in order to prevent moisture from entering the ends. The ends are more susceptible to moisture, as the pores of the wood are exposed. The application of this remedy will often prevent warping or winding of boards, which is particularly distressing after a piece has been shaped to its final size.

The pieces should be stored in a warm, dry room, and in any event care should be taken that they are exposed evenly. If a board is placed on the top of a pile of similar pieces, it will be noted that, if left overnight and the weather becomes rainy, the upper piece will be warped. This is caused by the absorption of moisture on the upper side, the resulting expansion forcing the piece to warp or curve.

Long pieces of wood under process should be set on end while being stored temporarily. The permanent storage should be in racks having supports about 2 ft. apart. If the supports are too far apart, the boards may warp or wind at intervening points. Boards in piles should be separated by strips about 1 in. thick, set about 3 ft. apart, in order that the lumber may be open to the air. This will keep the stock more uniformly dry.

Hanging Heavy Rug on a Line for Beating

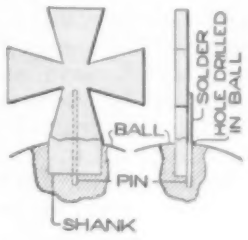
An easy way to put a heavy carpet, or rug, over a clothesline is to fasten two pulleys, one to the house and the other to a post or tree, or on two posts, and hang the line between them; then pull the rug over the line and draw up the ends of the line. A very heavy rug can be easily hung in this manner. The line should be long enough to reach over the pulleys and to the ground and have end enough at both supports for fastening.



When the Rug is Placed on the Line It is Easily Raised by Pulling the Rope Ends

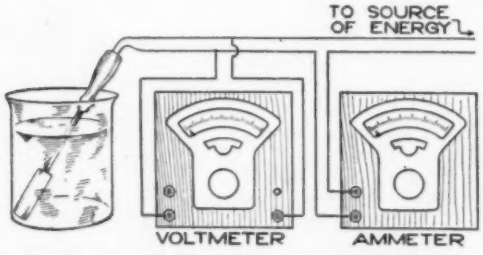
Repairing a Broken Metal Cross

A metal cross, the shank of which was imbedded in a plaster ball, broke off level with the top. Not wishing to remove some of the plaster to take out the shank, I soldered a stout brass pin on the back of the cross, allowing the pin to project far enough to fit solidly into a small hole back of the shank. This allowed the cracked edges to fit closely together so that the crack could be entirely concealed with a touch of bronze paint.—Contributed by James M. Kane, Doylestown, Pa.



To Determine the Efficiency of Electrically Heated Devices

The efficiency of any machine is defined as being the ratio of the output to the input expressed as a percentage, and both quantities must be measured



Connections to the Voltmeter and Ammeter for Measuring the Input to an Electric Heater

in the same units. For example, the output of a motor is 10 hp. when the power taken by the motor from the electric circuit to which it is connected is 9,325 watts. What is the efficiency? Since the output must be expressed in the same units it is necessary to change the 10 horsepower to watts or the 9,325 watts to horsepower. There are 746 watts in each horsepower. The 9,325 watts are equivalent to 9,325 ÷ 746 or 12.5 hp. The efficiency is then equal to 10 ÷ 12.5 or .8; that is, the output is .8 of the input or, when multiplied by 100 to change it to percentage, 80 per cent.

By way of an example, consider the efficiency of an electric heater, like the one shown in the illustration, which is immersed in water placed in a suitable vessel. The energy input to this heater in a given time may be easily determined by measuring the current passing through the heater circuit and the difference in pressure between the terminals of the heater. These measurements may be made, in case the heater is operated on a direct circuit, by means of any ammeter and voltmeter of suitable capacity, connected as shown. If the heater is operated on an alternating-current circuit, only alternating-current instruments can be used, as certain types of instruments will not operate when connected to such a circuit. In either case, the product of the ammeter reading in amperes and the voltmeter reading in volts will give the power taken by the heater in watts, assuming the heater winding to be noninductive. If the heater winding is not noninductive, then the current and the electrical pressure will no longer be in phase when the device is operating on an alternating-current circuit, and a wattmeter must be used. Practically all heating elements are wound noninductively so that the power may be measured by means of an ammeter and voltmeter.

The energy taken by a heater in a given time will be equal to the product of the average power and the time. For example, if the heater takes 300 watts for 30 minutes—½ hour—then the energy consumed is equal to 300 times ½ or 150 watt-hours, which is equal to .15 kilowatt-hour.

To determine the output of the heater is a little more difficult, but it may be approximated as follows: Since the object of the device is to convert electrical energy into heat energy the output must be measured in heat units. The unit of heat most commonly employed is the calorie, which is the heat required to raise the temperature of one gram of water one degree centigrade. Hence, if a certain weight of water has its temperature increased a definite number of degrees centigrade by the electric heater, then the total heat imparted to the water in calories will equal the weight of the water in grams multiplied by the change in temperature in degrees centigrade. Of course, the heat generated by the heater exceeds that obtained by the above calculation, due to the fact that some heat is imparted to the vessel containing the water and to the supports for the vessel, but it is only the heat imparted to the water that must be considered, as the other heat is not useful.

When the temperature of the water is raised to the boiling point and a part of the water is evaporated, the foregoing method of calculating the heat imparted to the water no longer holds good, and the following method must be used. Weigh the water before and

immediately after the test to determine the amount of evaporation. For each gram of water evaporated there will be required approximately 536 calories, and the heat in calories imparted to the water to raise its temperature to the boiling point will be equal to the difference between 100 and the initial temperature of the water multiplied by the weight of the water at the start. To determine the efficiency, the input to the heating element in electrical units must be changed to heat units which may be done by multiplying the power in watts by the time in seconds and this product in turn by .24, giving the result in calories. The following example may serve as a help in performing such an experiment or test.

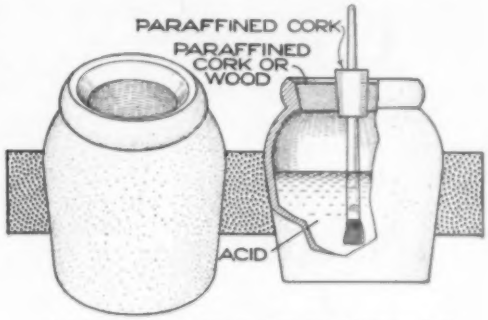
Weight of water at the start....	500.0	grams.
Weight of water at the end of test	474.5	grams.
Temperature of water at the start..	25	deg. C.
Average current taken by the heater	6.5	amperes.
Average pressure at the heater terminals	110	volts.
Time heater is connected.....	5⅛	minutes.
Change in temperature of the water	75	deg. C.
Heat developed in heater: $6.5 \times 110 \times 5\frac{1}{8} \times 60 \times .24 =$	56,628	calories.
Heat absorbed by water in coming to boiling point: $500 \times 75 =$	37,500	calories.
Heat used in evaporating 25.5 grams of water: $536 \times 25.5 =$	13,668	calories.
Total heat absorbed by water..	51,168	calories.
Efficiency of heater: $\frac{51,168}{56,628} \times 100 =$	90.4	per cent.

This value of efficiency may be increased by insulating the vessel with a nonconductor of heat and providing a covering for it, thus decreasing the losses to the air and surrounding objects.

The efficiency of an electric stove or electric iron, or, in fact, any electrically heated device, may be determined in a manner similar to the water heater. In the case of a stove, place a vessel filled with water on it and measure the heat imparted to the water in a given time, also the input to the heating element in the same time, from which data the efficiency may be calculated. In the case of an electric iron, dampened cloths may be ironed and the actual water evaporated by the iron, determined by weighing the cloths before and after the ironing, together with the increase in weight of the cloth on the ironing board, the time the iron is in use and the temperature of the cloths. The actual water evaporated is the difference in the weight of the cloths before and after ironing, minus the increase in weight of the cloth on the ironing board, which takes up some of the moisture from the cloths being ironed.

Earthen Mustard Pots Used as Acid Jars

A small earthen mustard pot of the type shown makes an ideal acid pot

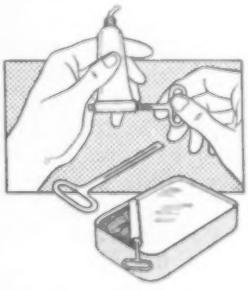


A Bottle Made from an Earthen Mustard Pot to Contain Acid

for the bench, as it is not only acid-proof but will not upset so easily as the ordinary acid bottle. The large cork, or stopper of soft wood, thoroughly boiled in hot paraffin, is bored for the insertion of another paraffined cork holding the acid-brush handle. If a coat of paraffin is given the handle, it will easily resist the action of the acid and last much longer.

Squeezing Paste from Tubes

Tubes of paste, glue, etc., may be more easily handled by applying an ordinary key, such as found on most cans containing fish put up in oil. The end of the tube is inserted in the slot of the key and then turned. —Contributed by J. H. Priestly, Lawrence, Mass.



Kitchen for Hikers

By PRESTON HELLER

WITH a view to provide all the needs of a commissary department for 36 boys for a period of four days, either on a hike or in a permanent camp, the kitchen illustrated was constructed. As it is placed on two wheels, which are removed when the kitchen is in use, it can be moved from one day's camp to another by attaching it to the rear of a horse-drawn wagon by means of a shaft. When the wheels are removed the entire outfit rests on legs, which are swung down from the bottom. The sides and one end are opened by swinging one half up and resting it on the top, while the other half swings down to a horizontal position where it is used as a work board, making all parts easily accessible.

The outside dimensions of the kitchen, when closed and in the form of a large box on wheels, are 5 ft. 3 in. long, 3 ft. wide, and 2½ ft. high. The main feature of this entire kitchen is its compactness. At the front, and extending about 1 ft. back, is a kitchen cabinet where the plates, sugar, salt, flour, etc., are kept in separate compartments. Here also are found the necessary cooking utensils, such as bread knives, butcher knives, cleaver, cooking spoons, pancake turner, sieves, large forks, lemon squeezer, etc.; and on the shelves of galvanized iron small boxes and packages of baking powder, cocoa, etc., are placed. This entire compartment, as well as all others where food is handled and prepared, is lined with No. 28 gauge galvanized iron which makes sanitation a feature also.

Upon passing around to one side there can be seen a large three-shelved oven, 21 in. wide, which is heated by a gasoline burner. Between the burner and the bottom of the oven are located coils of pipe for heating water, and these coils are connected with a tank of 7-gal. capacity, located just above the oven. An air valve and glass gauge are attached to the tank.

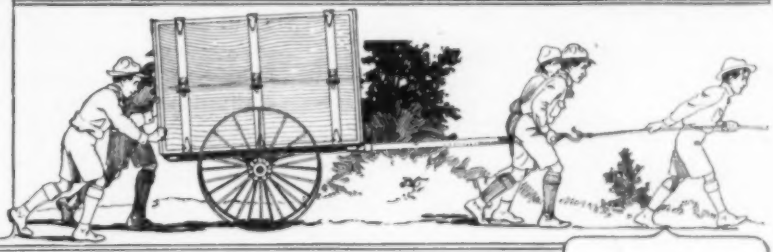
The next compartment to the rear is a large storage space, extending all the way through the kitchen, and a 2½-gal. forged-copper gasoline tank occupies a shelf in the upper portion of this space. At the rear end along this side are located nickelplated faucets which are connected with the hot-water tank mentioned; a 7-gal., white-enameled milk tank above; an 18-gal. cold-water tank, and an ice-water tank, used when distilled-water ice can be secured. These faucets all drain into a small sink, which, in turn, drains off through an ordinary sink drain to a hole dug in the ground beneath it. Practically the entire rear end of the kitchen is occupied by the large water tanks, ice box, and milk tanks, with the exception of a small space at the bottom where the silverware is kept in a drawer.

On the other side, and to the rear, two compartments above and below the large water tank form excellent storage space for ham, bacon, sausage, preserves, butter, etc., which need to be kept in a cool place. Next in line is the other end of the large storage place which extends through from the other side. Pans, pails, canned goods, larger packages, etc., are kept in this space.

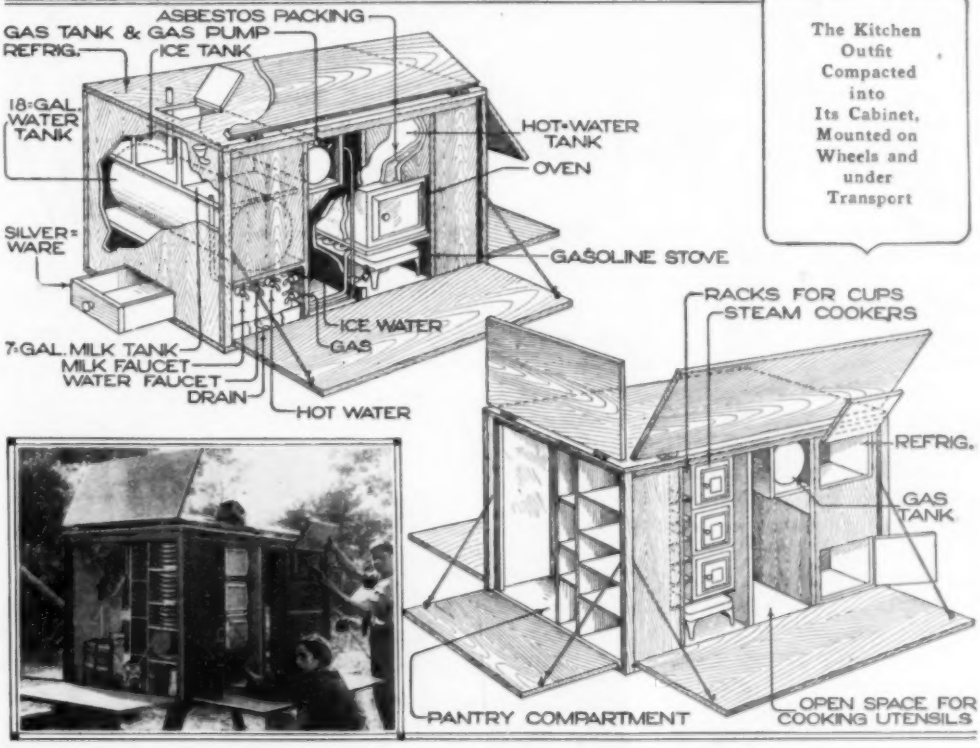
Immediately to the rear of the kitchen cabinet, on this side, are located compartment shelves where the tin cups are kept, and adjoining this is found a three-compartment steam cooker. By having the cups and plates near this steam cooker, which is also heated by a gas burner, there is less danger from rust, as they are kept thoroughly dried. Wherever there is a gasoline burner the compartment in which it is located is not only lined with galvanized iron, but asbestos in sheets is placed on the inner side, so that the heat will not ignite the interior packing or the woodwork. The tanks are accessible from the top of the kitchen for filling and cleaning, and are packed with ground cork.

The kitchen has shown its efficiency by giving satisfactory service in camps of many members.

Hungry Campers Quickly Provided For from the Compact, Easily Transported Kitchen, Shown with Supply Cabinets on Left and Utensil Cupboards on Right



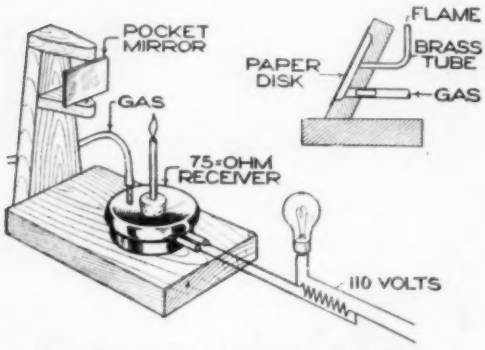
The Kitchen Outfit Compacted into Its Cabinet, Mounted on Wheels and under Transport



The Portable Kitchen Outfit Opened, Exposing the Various Compartments Arranged So as to Be Convenient: Above Stove and Cooking Compartments; Below, Pantry Compartment and Space for Utensils

Seeing an Alternating Current in a Mirror

It will almost appear impossible to those unfamiliar with laboratory methods that one may watch the vibrations



The Alternations of the Current may be Seen by Looking in the Mirror

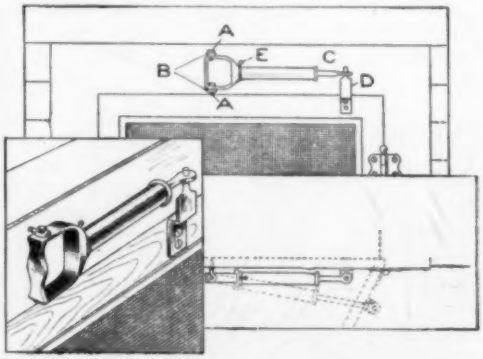
—3,600 per minute—of an alternating current in a little pocket mirror without the use of any apparatus other than a telephone receiver. The experiment is very interesting and instructive, one that may be performed at practically no expense.

Take an ordinary inexpensive watch-case receiver, drill a hole in the cover for a short piece of brass tubing, to make a gas connection, and then plug up the center opening with a cork, into which is tightly fitted a piece of ⅛-in. tubing. The upper end of this should be closed with a plug having a central opening about the size of a pin. Procure a small rectangular pocket mirror and remove the celluloid covering, and then, across the back, solder a piece of straight wire to form a vertical spindle, about which the mirror may be rotated. Connect any resistance, such as a magnet coil of 10 or 20 ohms, in series with an incandescent lamp, and then connect the receiver terminals to the ends of this resistance. In this manner an ideal alternating-current supply of a few volts to operate the receiver safely is secured. Turn on the gas only sufficient to produce a narrow pencil of flame, not over 1 in. long. Mount the mirror as shown, or hold the spindle between the thumb and forefinger of the left hand while rocking it back and forth with the right. Ordinarily only a streak of light will appear, but immediately upon turning on the current this streak will be broken up into a series of regular waves, flatter or sharper according to the speed with which the mirror is rocked. After carefully noting the wave form, connect the receiver with the primary of an ordinary medical coil, across the make-and-break, and note the marked difference in the waves.

By replacing the receiver with a block of wood having a circular depression, about 2 in. in diameter and ⅛ in. deep, over which is pasted a disk of smooth paper, the waves set up by the human voice may be observed if the talking is done loudly and close to the disk. The gas connection in this case is made from the back of the block, as shown. As the several vowels are sounded, the characteristic wave from each will be seen in the mirror. It is also interesting to increase the pitch of the voice and note how much finer the waves become.

Homemade Screen-Door Check

An outside screen door causes considerable annoyance by slamming when exposed to the wind, even if it is equipped with a bumper. Nothing



Air-Cushion Check Made of a Bicycle Foot Pump for a Screen Door

short of a door check will prevent this slamming, so I made a very simple

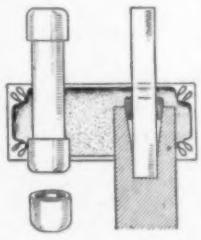
pneumatic check for our door, which works entirely satisfactorily.

A discarded bicycle foot pump was procured and hinged to the casing over the door, as shown in the illustration. The hinge was made as follows: Two holes, A, were drilled through the stirrup, as near the foot plate as possible; two ordinary screw eyes were turned into the door casing at B, and two pins were passed through the holes in the screw eyes and the holes in the stirrup. This allows the pump to swing when the door is opened. The end of the plunger rod C is flattened and a hole drilled through it to receive the pin at the top of the bracket D, which is screwed firmly to the door.

The action of the pump when the door is opened can be readily understood. The check is adjusted very easily by the machine screw E, which controls the exhaust of the air when the door closes. The screw is turned into the hole in the base of the pump where the pipe was originally connected. One side of the end of the screw is slightly flattened to allow a better adjustment. The pump can be quickly removed by pulling out the upper pin in the hinge part.—Contributed by M. C. Woodward, San Diego, California.

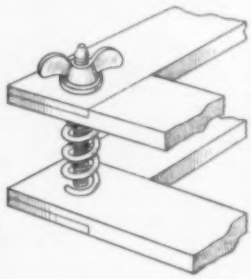
Bushing Made of Brass Tip on Cartridge Fuse

In order to fasten a short piece of tubing in a socket which had become worn to a funnel shape, without having to tap the socket and put in a threaded bushing, it was fixed as follows: One of the brass tips on a spent cartridge fuse was cut off and one of its ends filed tapering. After trimming the fiber lining so that it would fit snugly over the tube, it was driven home. The combination of brass and fiber adjusted itself nicely to the shape of the worn socket and made a tight fit.



Opening Springs for a Tennis-Racket Clamp

When putting a tennis racket in a press, it is difficult to keep the press open to let the racket slip in. This can be easily remedied by simply putting a small coil spring around each of the four bolts, as shown. This will always open the press when the bolts are loosened. — Contributed by W. X. Brodnax, Jr., Bethlehem, Pa.



Magic-Paper Fortune Telling

At outdoor carnivals and fairs there is usually a fortune teller who uses a glass wand to cause one's fortune to appear on a pad of paper. Anyone may perform this trick by observing the following directions.

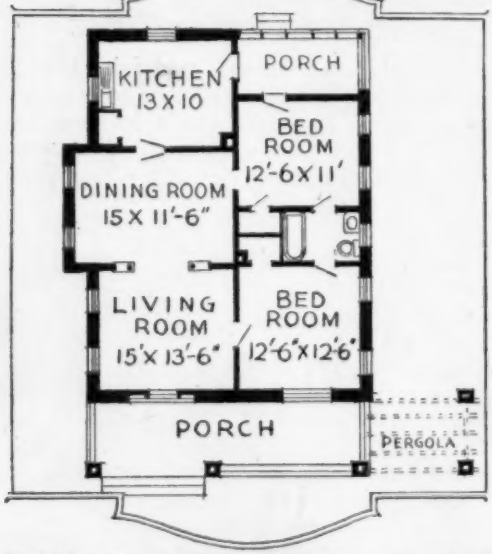
Instead of a glass wand use a long, narrow bottle of glass. Dip a new pen into copper sulphate, diluted with six parts of water, and write out the "fortune" on a piece of paper. The writing, when dry, will not be visible. Next procure two corks to fit the bottle. An unprepared cork is placed in the bottle and the other is pocketed, after hollowing it out and inserting a small sponge soaked in pure ammonia.

The bottle with the cork is passed out for examination. The cork is casually placed into the pocket after it is returned by a bystander. A pad of paper is then proffered and an initial is placed on the pad of paper by the person whose "fortune" is to be told. The paper is rolled up, with the prepared side on the inside, and inserted into the glass bottle. The fumes of ammonia will develop the mysterious message. The trick can be repeated if several prepared sheets of paper are on hand, and always proves of interest in a party of young persons.

May 15 Cents

PLEASING BRICK BUNGALOW OF MODERATE COST

C. C. CATES, ARCHITECT, DALLAS, TEXAS



THAT rare combination, attractiveness and economy, are to be found in this modest but pleasing brick bungalow, which is of a design adaptable to almost any climate. While its broad, low roof, exposed rafters, and pergola give it a touch which suggests the land of perpetual sunshine, its heavy brick columns, stanch walls, and substantial-looking balustrade make it well-fitted in appearance for the North.

The structure has effective lines which command attention. Its front and approach are attractive, while the sides, although very plain, harmonize architecturally with the rest of the structure and contribute to the appearance instead of detracting from it, as is too often the case in small, low-priced houses. Shrubbery and flowers deserve a large proportion of credit for the homelike atmosphere of the structure. Without the exterior decorations it would be only a house. With small expense and little work a prim, appealing tone has been developed which no architect nor builder alone could supply.

A glance at the floor plan shows clearly the interior scheme. Plenty of windows, two large closets, and a roomy back porch, which may be inclosed if desired, are provided. The front door gives direct access to the living room, immediately back of which are the dining room and kitchen. The latter has an ample pantry, which if necessary could be used as a storage place, adjacent to a swinging door leading to the dining room. On the opposite side of the house are two bedchambers separated by a bathroom and a couple of closets. Entrance to the front bedroom is gained by way of the living room, while the rear one has doors leading into the dining room and onto the back porch. While the rooms are not large, none of them are cramped and all are adequate for the needs of the average family of two or three members. The cost of building the structure will obviously vary in different localities, and this also brings up the heating question, but the architect's estimate is $1,700. Where labor and building materials are available at reasonable figures, there should be no difficulty in erecting the bungalow at the estimated price.

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May

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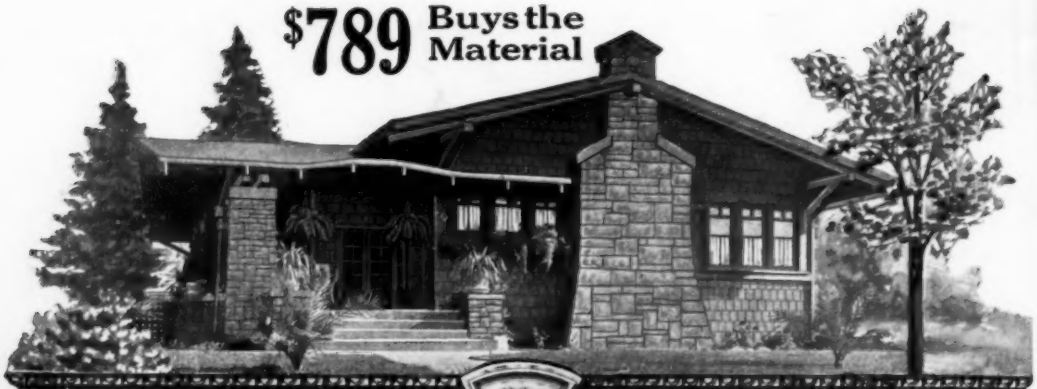

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